TECHNOLOGY DEPARTMENT

SEPTEMBER, 1948

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Plant Engineering

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Volume 2, No. 9

The magazine that helps plant engineers with their everyday problems

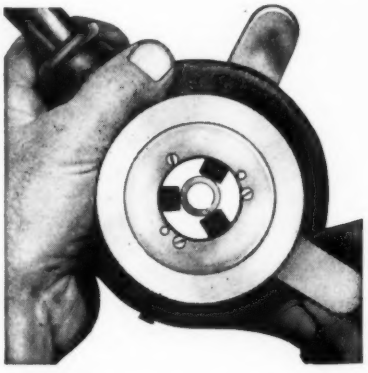
. . . old favorites . . .

The BEAVERETTES

THESE handy little self-contained threaders popularly known as the "Beaverettes" have been favorites for many years. Of patented design, there is nothing similar to them on the market. They are self-contained —that is, the tool is a complete unit with no loose parts of any kind. They are fully-adjustable for cutting standard, oversize or undersize threads. They cover a useful range — ¼, ⅜, ½ and ¾-inch. When desired extra dies are available for ⅛-inch size (by changing dies). The No. 6 Beaver is a two-handle non-ratchet tool; the No. 6-R, a standard one-handle ratchet tool, suitable for either bench or confined area use. American or British standards. Right or Left.

(Left) the two sets of dies—required because of different thread pitches within the range—remain in the tool and are adjusted to cut standard, oversize or undersize threads by setting the index ring. No tools required!

(Right) Beverette tools are accurately centered on all sizes of pipes within the operating range by a smooth-working self-centering universal chuck. No loose parts—and accurate centering!

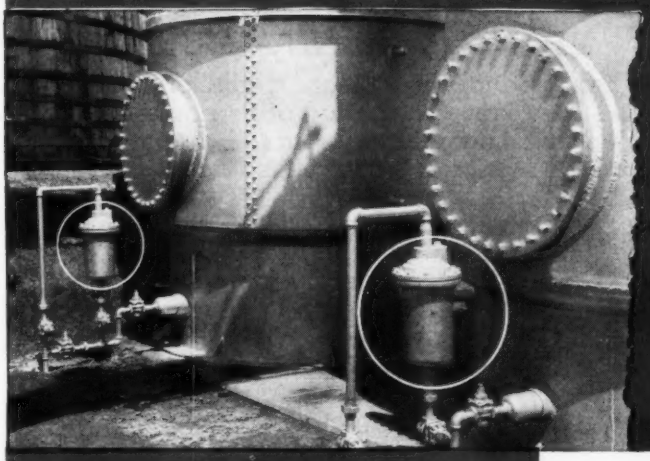


BEAVER PIPE TOOLS

210 DIANA AVENUE *Quality Tools—Since 1900* **WARREN, OHIO**

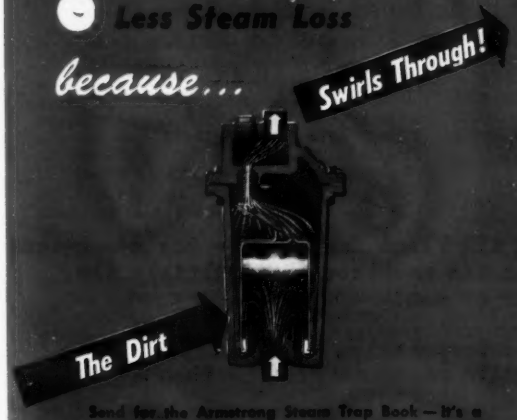
Dirt Doesn't Hurt

AN ARMSTRONG TRAP



- Less Maintenance
- Longer Life
- Better Drainage
- Greater Dependability
- Less Steam Loss

because...



Send for the Armstrong Steam Trap Book — it's a practical guide to better trapping. Facts, figures and diagrams on trap selection, capacities, prices, installation and maintenance.

NO ONE wants equipment that has to be babied. A steam trap that won't handle ordinary dirt and scale means a lot of work for the maintenance crew. If it clogs up it may not discharge condensate —a pretty note if it's on a critical application. Or it may stick open and waste a lot of steam—until somebody comes along and discovers it.

With Armstrong Traps you don't have these problems. There are no dead spots in which dirt can collect. There are no close-fitting parts to clog up or stick. The discharge orifice is nice and big, it can't foul up*. No dirt can lodge on the valve or seat to prevent steam-tight closing. You don't have to baby Armstrong traps — they seldom need attention.

Where dependable service counts, it pays to buy ARMSTRONG.

ARMSTRONG MACHINE WORKS

912 Maple St., Three Rivers, Mich.

*Armstrong won't build its little No. 800 trap for pressures above 125 psi. because it would necessitate too small a discharge orifice. Who wants a trap with an orifice which might plug up with dirt?

ARMSTRONG *Inverted Bucket* **STEAM TRAPS**

Over a Million in Use...For Power...Process...Heating

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'Round About with the Editors

THE PLANT ENGINEER

When production is pleasing and prosperous,
And the plant is all proud of its name,
The Plant Engineer is a marvel,
And the Manager sings of his fame.

But conveyors can catch at the cogwheels,
And compressors can limp and go lame,
And the manager points out his finger,
And the Plant Engineer is to blame.

And ever the tempo is tightened,
And ever the weak spots appear,
And ever the weak spots are strengthened,
But never the Plant Engineer.

The manager manages business,
The man on the line stakes a claim;
But whenever the plant has a breakdown—
It's the Plant Engineer that's to blame!

The weekends of work and the worry,
The presses, the power, and the plant,
It's a job that he hates — yet he loves it—
He'd quit if he could — but he can't.

Tom Hadley

Dedicated to all Plant Engineers - the men behind the men that man the machines that multiply the productive power of man.

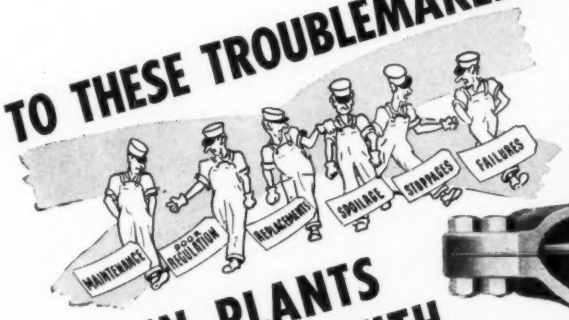
No Corporation ever can
Build machines greater than a man's

T. Ed. H.

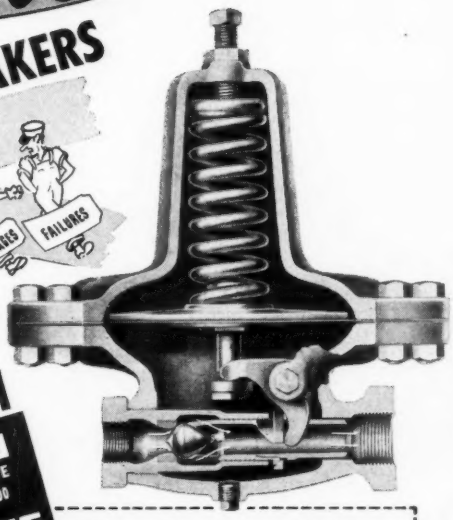
Reprints of Tom Hadley's poem, suitable for framing, are available upon request to the Editor, PLANT ENGINEERING. The poem is reprinted in this form by popular request, with the permission of the author and the Editor of Kreolite News. By vocation Tom Hadley was a member of the General Motors Executive staff, Head of the Architectural Section of the Fisher Body Works Engineering Department. By avocation he is a naturalist, wildlife photographer, poet and philosopher.

Plant Engineering is published monthly at 53 W. Jackson Blvd., Chicago 4, Ill. Subscription price $10.00 per year to U. S. A. $11.00 to Canada. $12.00 to other countries. Single copy $1.00. Application is pending for acceptance under Act of June 5, 1934.

IT'S GOODBYE Forever TO THESE TROUBLEMAKERS



IN PLANTS EQUIPPED WITH CASH STANDARD Streamlined PRESSURE REDUCING VALVES TYPE 1000



The Reasons Why IT HAPPENS ARE TOLD BY USERS AS FOLLOWS . . .

Check what the users say against the Benefit Points Below

• A Rubber Goods Manufacturer says—

"We have used these Type '1000' valves for several years with fine results on air or water service at pressures from 10 lb. to 300 lb. depending on requirements. These valves as claimed have been found to have **LARGE CAPACITIES.** On **FLUCTUATING LOADS** or **STEADY LOADS** they are **MOST DEPENDABLE, RAPID IN ACTION** with a **QUICK DEMAND** and **TIGHT CLOSING** when the load drops off. They require but a **MINIMUM OF SERVICE OR MAINTENANCE."**

• A Chemical manufacturer says—

"The CASH STANDARD Type '1000' valves which we have in service have fulfilled the conditions checked . . . **(ACCURATE PRESSURE CONTROL UNDER TOUGHEST WORKING CONDITIONS), (TROUBLE FREE SERVICE), (TIGHT CLOSURE)** better than any other steam pressure reducing valves that we have used."

• A Metal Products company says—

"We have had a number of your CASH STANDARD Type '1000' valves in operation in our plant for a number of years. These valves have proved to be satisfactory in every respect. We particularly like this type of valve because it is **SIMPLE TO INSTALL, REQUIRES A MINIMUM OF MAINTENANCE,** and gives **CONTINUOUS** and **UNIFORM PRESSURE CONTROL.**

• A Plant Engineer says—

"We find that the CASH STANDARD Type '1000' streamlined valves are best suited for our various applications of compression molding because of their **VERY WIDE RANGE OF ACCURATE PRESSURE CONTROL.** The simplicity of construction of these valves has kept the **MAINTENANCE COSTS VERY LOW** which of course means a **SAVING IN COST OF OPERATION,** and **SPEEDIER PRODUCTION.**

1. **Maximum capacity when needed most.**
2. **Accurate pressure control under toughest working conditions.**
3. **Trouble-free service.**
4. **Smooth operation.**
5. **Tight closure.**
6. **Speedier production results.**
7. **Elimination of failures.**
8. **Cost-saving operation.**
9. **No spoilage.**
10. **Practically zero in maintenance.**

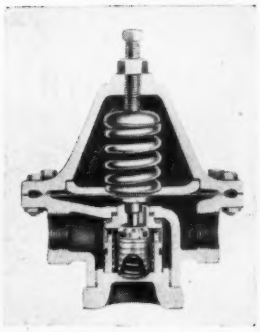
WRITE FOR BULLETIN 962

CASH STANDARD CONTROLS . . . VALVES

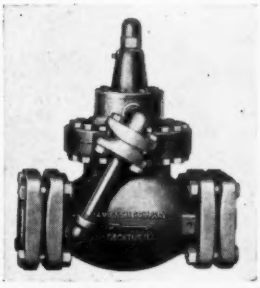
A. W. CASH COMPANY
DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES

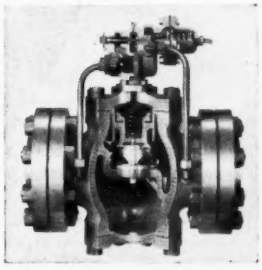
Send for them



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

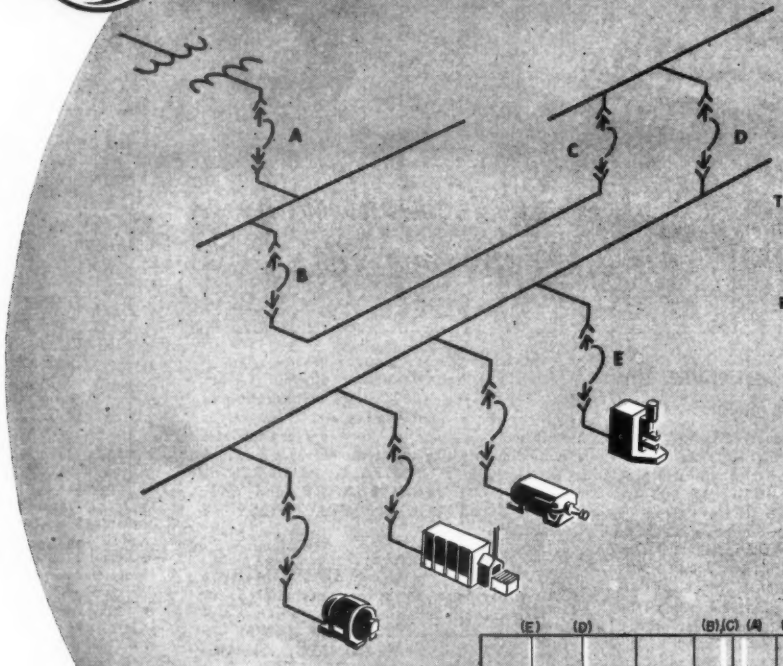


Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

PREVENT COMPLETE

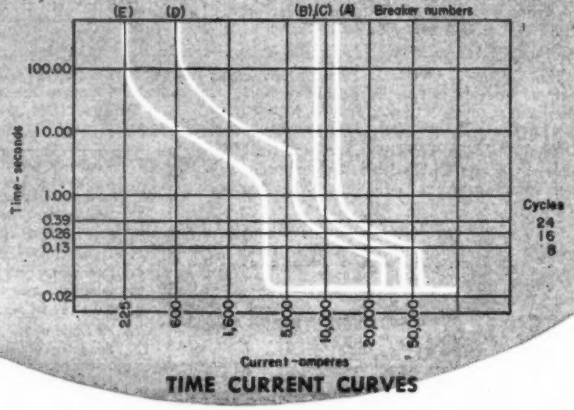
WITH

SELECTIVE TRIPPING...



Typical selective-operation low-voltage distribution system.

A	Main Supply Breaker
B, C	Bus Tie Breakers
D	Feeder Breaker
E	Load Breakers



TIME CURRENT CURVES

The time current characteristic of the load breaker E of a typical low-voltage distribution system is shown at the right. A fault of 20,000 amperes trips this breaker instantly and the fault current, which also flowed through breakers A, B, C, and D, is interrupted in 2 cycles or less. If the current persists for as long as 8 cycles, breaker E has not opened and the fault is not at the load but must lie between breakers D and E. After 8 cycles, breaker D trips, and interrupts the circuit. If the fault persists for 16 cycles, breaker D has not opened and the fault must lie between breakers C and D. Breaker C then trips and interrupts the circuit.

POWER SHUTDOWNS

USE THE NEW AK-1 AIR CIRCUIT BREAKER

With this new breaker you can set up *completely* selective low-voltage power distribution systems using full interrupting-rating breakers. Selective systems eliminate costly production delays caused by main breaker tripping. Faults at remote points are isolated; will not trip the main supply breaker.

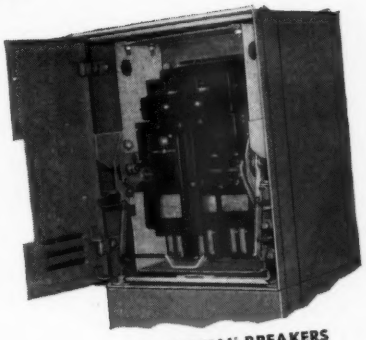
NEW, SEALED TRIPPING DEVICE on the AK-1 makes selective operation possible. It causes the feeder breaker to wait for operation of the load breaker; the main supply breaker or bus tie breaker to wait for operation of the feeder breaker.

DELAYED OVERCURRENT TRIP DEVICE is easily removable. It may be replaced in the field by a factory-calibrated unit either to change the current rating or to obtain different characteristics. Pickup of the long-time or short-time element is readily adjustable. Time settings are fixed to avoid incorrect sequence.

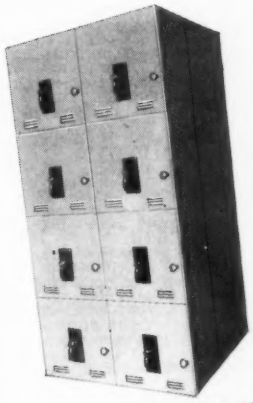
LONG TIME DELAY is obtained by a positive displacement piston operating in silicone fluid. The silicone fluid prevents sludging and reduces the effect of ambient temperature. Complete sealing of the element eliminates any maintenance. Short-time delay of 8, 16, or 24 cycles is produced by a simple mechanical escapement.

GENERAL PURPOSE LOAD characteristics provide 5 seconds delay at six times normal current for normal overload protection. For motor starting, a second characteristic is available, giving 15 seconds delay at six times normal current. The instantaneous trip is set to operate at 15 times normal.

For complete information about selective operation on your system with the new AK-1 breaker, see your G-E sales representative. Also, write for bulletin GET-1485 "Selective Operation with Air Circuit Breakers." *Apparatus Department, Section D860-34, General Electric Company, Schenectady 5, New York.*



INDIVIDUAL BREAKERS
Improved arc interruption
Multiple arcing contacts
Interchangeable trip units
Interrupting capacity
Ask for bulletin GEA-4951



METAL-ENCLOSED DRAWOUT UNITS
Smaller space required
Improved bus construction
New rack-out mechanism
Easily removable breakers
Ask for bulletin GEA-4966

GENERAL ELECTRIC

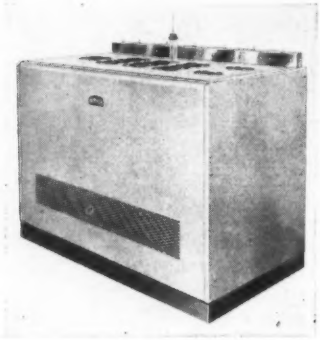
D60-34

New Products and Methods

WHAT'S NEW? Here industrial ingenuity is summarized for your quick review. If you want additional information or have questions on specific applications use the addressed no-obligation, no-postage card between pages 18-19 and 50-51

Pour Test Unit

1 A new cloud and pour test unit is available. The unit conforms with ASTM, API and ASA Standards for all cloud and pour testing. Two more temperature factors, 77 F, 118 F, and an adjustable factor from -60 F to -80 F for determination of very low pour points have been provided for complete testing in one unit.



Stainless steel tanks contain 32 copper sleeve test tube inserts with four sleeves from -60 F to -80 F, eight at -30 F, eight at 0 F, eight at 30 F, two at 77 F, and two at 118 F. Temperatures are controlled by built-in thermostats.

The cabinet measures 52 by 39 in. Current required, 110 v, 60 Cy., S.Ph., a. c. Refrigeration is provided by a self-contained, two-stage, air-cooled condensing unit. Bowser, Inc.

Lilac Odor Solvent

2 Gunk self-emulsifying and self-scouring solvents are now to be available in a new high-boiling, non-phenolic type concentrate possessing the characteristic odor of lilac.

The new non-phenolic super concentrate will be designated P-92 and its characteristic lilac odor solves the problem for those who wish a high performance self-emulsifying and self-scouring solvent without a health soap odor. The new Gunk dilutes with ten volumes of kerosene or liquid diesel fuel distillate and is said to be especially formulated for washing and degreasing chassis and engine blocks and to leave brilliantly clean surfaces, free from dust-catching film. Curran Ordnance Chemical Laboratory.

Grommet Inserter

3 This new device, called the grommet inserter, was developed to supply the need for an efficient hand tool that would overcome the difficulties involved when inserting grommets into panels, chassis. Operation is simple. Merely slip the nose of the tool through the hole which is to receive the grommet, place a grommet into the claw nose, withdraw the tool and the grommet is automatically inserted in position. No preparatory treatment of the grommets is necessary. Snug fitting is assured because the undersize grommets need not be used to make inserting easier. Damage to grommets-ordinarily caused by forcing and jamming methods is eliminated when using this new device.

The maker states that the tool is durably constructed to withstand hard use; the tempered steel inserting claw has only one moving part, nothing to get out of

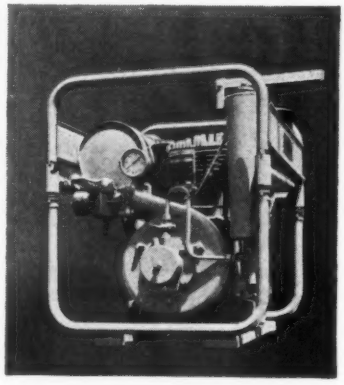
order; the hardwood handle has a comfort-grip to reduce fatigue. Available in four standard sizes, for inserting ¼, $\frac{9}{16}$, ⅜ and $\frac{7}{8}$ in. grommets. Special sizes are also available. D. B. Rich Manufacturing Co.

Insulation Calculator

4 Available to interested engineers is a pocket insulation calculator for both insulating block and cement. Thickness of insulation required for various cold face and furnace temperatures may be read directly on the calculator. Heat losses in Btu per hr per ft through the insulation are also given. The calculator is made of thin plastic, measuring approximately 1½ by 6¼ in. In addition to the insulation data, there are four, 6-in. architects' scales along the edges. The calculator may be had free of charge on request. Forty-Eight Insulations, Inc.

Portable Pump

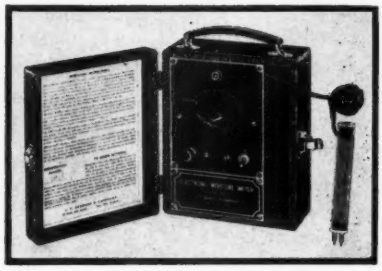
5 A new self-powered Model FZZ centrifugal pumping unit meets the need for a portable general-purpose unit for numerous applications requiring dependable operation. Measuring just $20\frac{9}{16}$ by $22\frac{5}{8}$ by $25\frac{1}{8}$ in., and available either with hand carrying frame, a barrow type carriage with pneumatic tires, or for



stationary mounting, the Model FZZ is a complete pumping system ready for immediate use. Capacity: 60 gpm at 90 psi and 150 gpm at 30 psi. The single stage centrifugal pump is bolted directly to a 7.7 hp 4 cycle air-cooled Briggs & Stratton gasoline engine. Hale Fire Pump Co.

Moisture Meter

6 The development of the electronic moisture meter now makes it possible to determine instantly and accurately whether or not the moisture content of a surface is beyond safety limits.The instrument is very small and compact, weighing only five pounds and measuring 4 by 9 by 7 in. It is completely port-



able, operating on tiny high powered A and B batteries having a total output of 91½ v. Separate calibrations are provided for the testing of wood or plaster and brick surfaces. No previous experience or knowledge whatsoever is required to operate the instrument. Model BD3 for measuring moisture of surfaces to be painted is priced at $49.50. L. R. Bradley & Co.

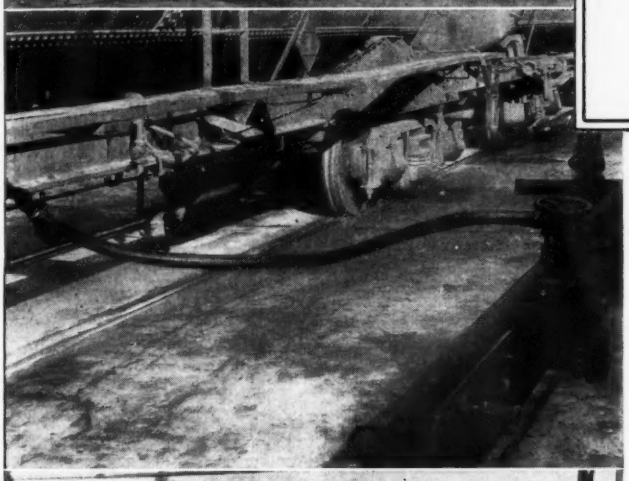
Wiring Test Set

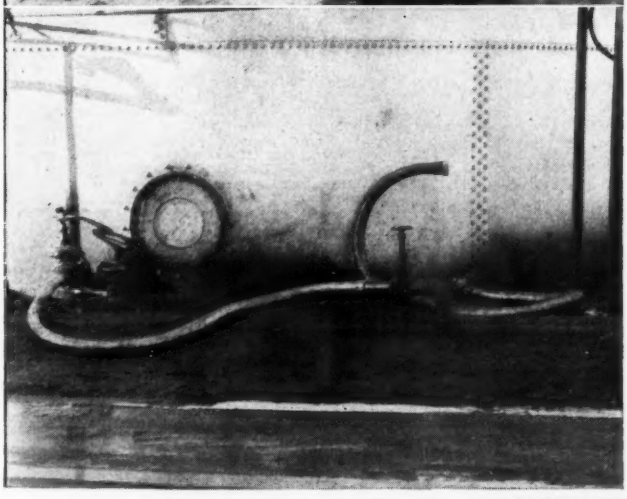
7 This wiring inspector's test set has been developed to enable one person to make a complete test of the wiring in any building without additional help. The device is housed in a gray fiber carrying case measuring $14\frac{7}{16}$ by $7\frac{5}{16}$ by $9\frac{1}{8}$ in. high. Total weight is 13

lb. A compartment provides storage space for the flexible leads and the portable meter. Power is supplied from a standard 6 v dry cell, which can be easily replaced. All standard electrical component parts are used throughout. Eastern Specialty Co.

Tempering-Controller

8 Announced is this water tempering controller. Designed to last for the life of the installation, this valve accurately maintains constant predetermined water temperatures at its outlet—regardless of heater tank or tankless heater temperature variations. It also automatically compensates for normal pressure fluctuations. It may be installed





CMH REX-TUBE Type RT-15

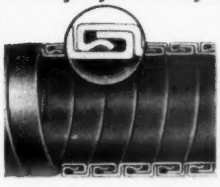
the economical, dependable fully interlocked flexible metal hose

CMH REX-TUBE, Type RT-15, flexible metal hose offers users seven important advantages which add up to dependability with economy—

(1) HIGHLY FLEXIBLE—Fully interlocked construction.
(2) DURABLE—Manufactured of bronze or steel.
(3) VERSATILE—Suitable for conveying steam, tar, asphalt, vegetable oils, hydrocarbons, as examples.
(4) NON-AGING—Durable metal construction.
(5) NON-CONTAMINATING—Corrosion resistance of metal.
(6) NON-COLLAPSIBLE—Does not collapse or get out of round, hence maintains full flow area.
(7) NO JOINTS TO PACK—The hose takes the motion, not the couplings.

Write today for complete information on how Rex-Tube RT-15, can serve you economically and dependably. Data sheets and specifications furnished on request.

Rex-Tube is part of CMH's complete line of flexible metal hose and related products. Write for further information.



REX-TUBE TYPE RT-15—Fully interlocked flexible metal hose. Sizes ¼" thru 12", I.D. Suitable for temperatures to 600°F and pressures to 500 psi.

"FLEXON" identifies CMH products, which have served industry for more than 45 years.

"the science of FLEXONICS . . ."the controlled bending of thin metals for use under varying conditions of temperature, pressure, vibration and corrosion"... is exemplified in the basic products of Chicago Metal Hose Corporation.

CMH FLEXIBLE METAL HOSE

CHICAGO METAL HOSE CORPORATION

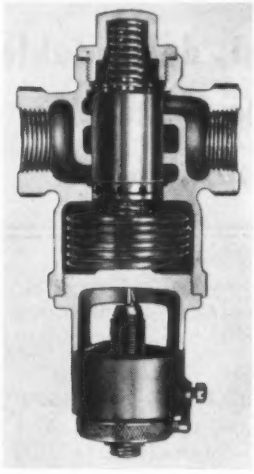
Maywood, Illinois

Plants at Maywood, Elgin and Rock Falls, Illinois

In Canada: Canadian Metal Hose Company, Limited, Brampton, Ontario

New Products and Methods

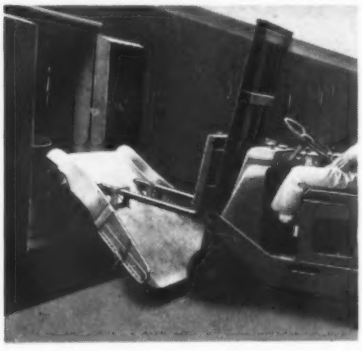
anywhere along the line for zone control. A feature is the solid fill bellows which actuates it. This bellows is mounted out of water in a protected chamber open to atmosphere. Hence, it is not subject to the deteriorating action of its own flow. The unit is interchangeable and easily removed.



Valve may be set for any desired discharge temperature between 100 F and 170 F. Setting is made on a dial calibrated in 10 deg units with a 5 deg space in between. Valves are available in ¾ and 1 in. sizes. Approximate capacity of the ¾ in. is 20 gpm at 50 psi, while the 1 in. size can deliver approxmiately 35 gpm at 50 psi. Symmons Engineering Co.

Truck Ramp

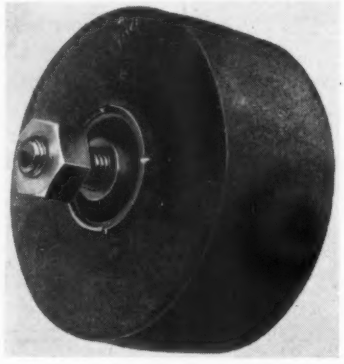
9 The Refrigerator Ramp is shaped so as to fit into the narrow doors of refrigerator cars. It is picked up and transported to position by a fork lift truck. The forks pick up the ramp by means of lift handles which drop flush with the riding surface when the ramp is in use. The fork truck operator places the ramp to span the gap between car and platform, withdraws forks, drops handles



and inserts locking pins which secure the ramp in position. A two-position fixed door stop assures a snug fit of the ramp against wide or narrow refrigerator car door sills. The manufacturer states that the entire operation of positioning and locking the ramp can be accomplished by the fork truck operator alone in less than two min. It is being manufactured in two standard sizes. One will span gaps from 15 to 32 in., the other, gaps from 24 to 44 in. Both have 15,000 lb capacity. Elizabeth Iron Works.

Conveyor Roller

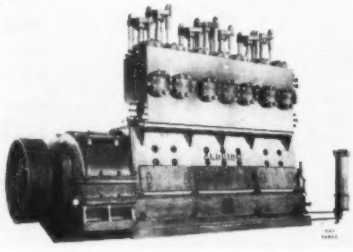
10 Announcement of a new rubber conveyor roller is made. The manufacturer states that this roller, of neoprene sponge rubber, will protect metal panel work and other production items from costly dents and scratches



on conveyor lines. The neoprene rubber is said to be oil and abrasion resistant and provides a firm support, yet is soft enough to conform to contours and absorb shocks. Rollers are 4 in. dia. by 2 in. wide and are provided with 2 free rolling ball bearings. They are mounted with a standard ½ in. bolt and nut assembly. Wolverine Tool Co.

High Pressure Pumps

11 A new design development of particular interest to users of high-pressure pumps has been announced. This company has standardized the design of 6 in. stroke Triplex, Quintuplex, Septuplex and Nonuplex and 7, 7½



and 8 in. stroke Quintuplex, Septuplex and Nonuplex Pumps to permit use of identical wearing parts such as bearings, crossheads, wristpins and valves regardless of plunger diameter and number of plungers. Increases in capacity are accomplished by increasing the number of pumping units. Pumps are supplied with 3, 5, 7 and 9 plungers. In the 6 in. stroke line, the Triplex has a 300 hp rating, the Quintuplex has 500 hp, the Septuplex has 700 hp and the Nonuplex carries the hp rating to 900. The 7, 7½, and 8 in. stroke pumps carry the ratings from 1300 hp to 2400 hp. Ring joint construction to all flanges can be incorporated, and, if interchangeability of plunger sizes is desired, stuffing box linings can be provided.

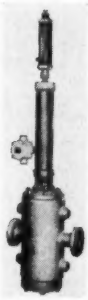
This type of design over a wide range of sizes will cut down investment in spare parts and will decrease inventory of spare parts. It will also greatly reduce complications in ordering and accidental duplication of parts. Aldrich Pump Co.

Aluminum Ladder

12 This ladder has several unusual features, including a new patented design of the extruded aluminum step with safety ridges to prevent slipping. Legs of the steps are girder-shape for additional strength and firmly riveted so that the ladder becomes more rigid as greater weight is applied. Thus common step-rocking is eliminated. The feet of the ladder are equipped with special rubber guards to protect floors and eliminate slipping. The sturdy work shelf and top shelf are covered with heavy rubber matting. The manufacturer claims the ladders are long lasting and will not corrode, splinter or warp because of their all aluminum construction.

The Featherweight aluminum ladder has been successfully tested for over 1,000 lb working load. The ladder is available in 2, 3, 4, 5, and 6 ft heights. Bardwell & McAlister, Inc.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51



Left: Aluminum Ladder
Right: Flow Meter

Jacketed Flow Meter

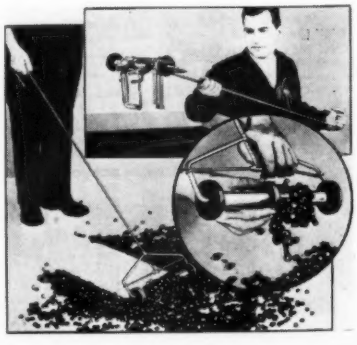
13 Announced is a new steam jacketed flowrator instrument designed for materials having high melting points such as molten sulphur, naphthalene and phosphorus. Remote totalization, recording and control of the flow rate is available. Flow indication is also provided at the primary element.

The meter indicating extension is furnished with steam heating coils and the entire meter body is jacketed for 100 psi to insure that the material metered remains in the liquid phase in all parts of the metering instrument. Reports of many highly successful installations confirm the soundness of this new severe service meter design. Fischer & Porter Co.

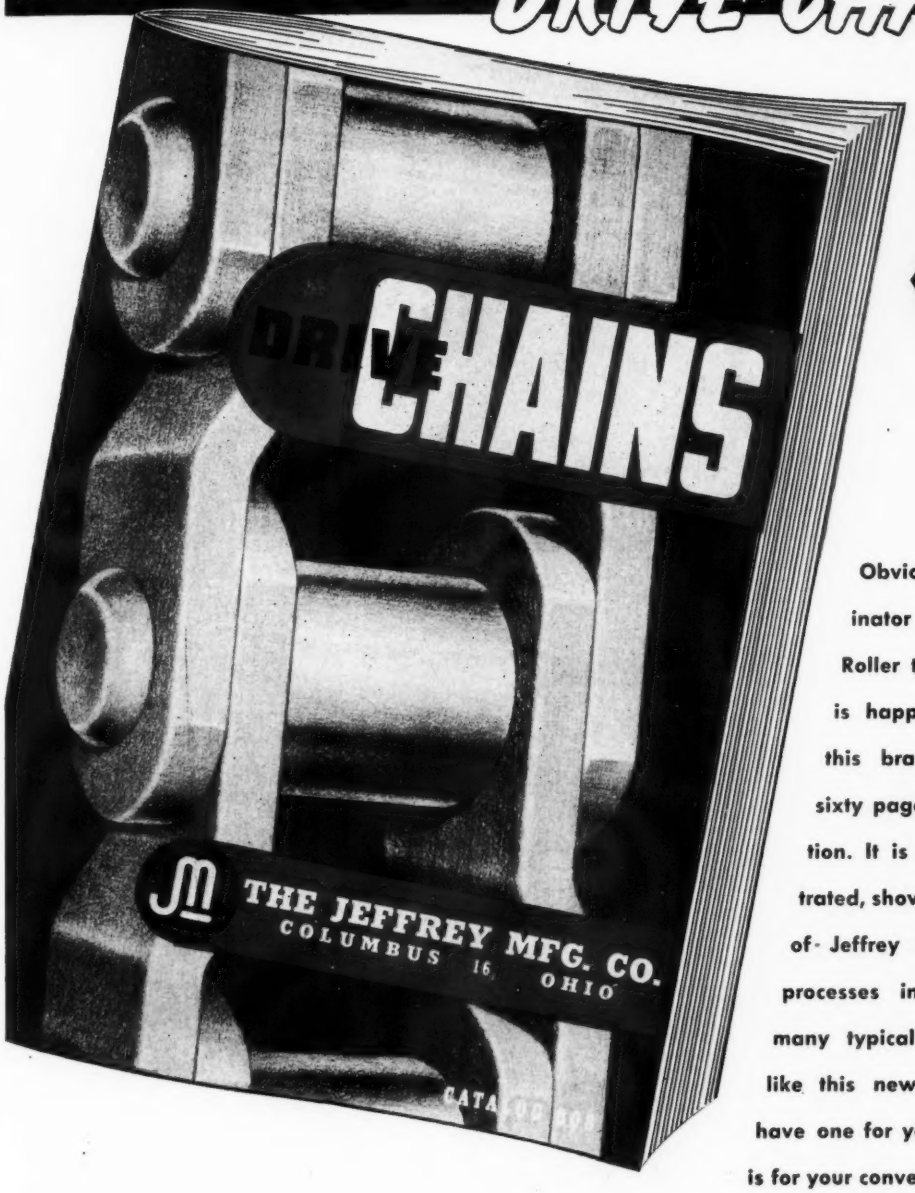
Rotary Magnets

14 New loading and releasing principles feature a complete new line of non-electric rotary magnets now in production. Improved design provides greatly increased carrying capacity plus efficient releasing in retrieving from tanks, separating ferrous from non-ferrous materials, picking up steel from floors, or nails from parking lots, cleaning tramp iron from conveyors and many other purposes. The maker states these units will retain their strength forever without

(Continued on page 12)



Send for this new book on DRIVE CHAINS



Obviously, being the originator of the Steel Thimble Roller type of chain, Jeffrey is happy to present to you this brand new book with sixty pages of useful information. It is also profusely illustrated, showing the complete line of Jeffrey STR chains, various processes in chain-making and many typical applications. You'll like this new catalog . . should have one for your files. The coupon is for your convenience.

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New Products and Methods

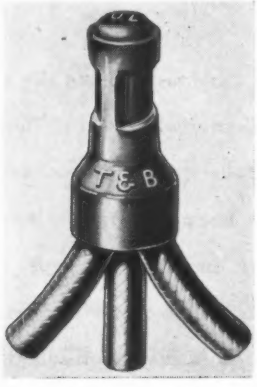
(Continued from page 10)

charging, requiring no wires or electricity. The Alnico permanent magnets are sealed in a metal tube mounted rigidly between Neoprene wheels in the carrying frame. Handle is attached to frame and unit is rolled; the tube revolves with the wheels and the entire magnetic surface becomes loaded, thus providing capacity greater than when only underside of magnet can be loaded. Capacity depends on size, weight and iron content of load components. Unloading is accomplished by pushing Neoprene wiper ring to a non-magnetic area at one end, where the load drops off. "Grabbing" tanks is prevented by the wheels; and parts jump up 1 or 2 inches to the tube. The action is equally effective above conveyors.

Standard wheel diameter is 2⅝ in., length of smallest model is 9½ in., larger units being 13¾, 18 and 22¼ in. Multi-finish Mfg. Co.

Wire Joint

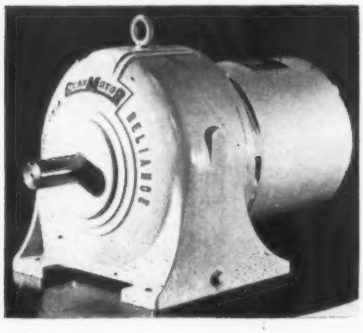
15 A new and specialized solderless wire joint particularly designed to meet the requirements of fixture and appliance manufacturers has been announced. Construction consists of high-strength, high dielectric insulation permanently molded around a seamless bronze barrel that becomes an integral part of the connector. Its new design permits both complete connection and insulation of wiring in one operation. Thomas & Betts Co.



New Gearmotor

16 A completely new gearmotor of unusually compact design and possessing important application advantages for every major industry has been developed. To be built in six basic sizes or diameters capable of delivering from 1 to 60 hp, the new helical type horizontal units are complete integral ac, or dc, motors with flange mounting and operate in a speed range of from 7½ to 780 rpm. Single, double, and triple reduction units will be available in each size.

Use of a flange-mounted motor, complete with bearings and bracket, and with shaft modified only to permit mounting of a hardened pinion, will permit many standard or special motor enclosure types to be used without expensive adaptations. A number of enclosure types, including protected open, splash-proof, grip-proof, totally enclosed non-ventilated, totally-enclosed fan-cooled, Underwriters' Class I-Group D, Class II-Groups F and G, and Bureau of Mines' and thus be bolted to any of the gear elements without alteration. Reliance Electric & Engineering Co.



Luminous Signs

17 Power failure can be a serious safety hazard when a number of people are gathered under conditions where a power failure may cause panic. But, with phosphorescent safety signs available to mark all exits and fire escapes, this hazard can be eliminated. These glowing signs are visible in total darkness long after the usefulness of ordinary signs has ceased, and they serve as ordinary signs in bright light or daylight.

In addition, hallway markers can be used to point to exits and fire escapes, to fire hose and to other fire fighting equipment, first aid stations, and other vital points in a building or plant. New Jersey Zinc Co.

Steel-Wood Shelving

18 Announced is a new line of steel-wood shelving, for which the maker states the following claims: All upright members are steel and every wood shelf is steel reinforced. The shelves are hardwood. Quick and easy shelf adjustment is assured with the shelf clip and stud. No bolts or nuts. Easy to set-up, dismantle or rearrange because there are but few parts to handle. In addition to strength and safety it is rigid and free standing and requires no bracing to wall or ceiling. Lyon Metal Products, Inc.

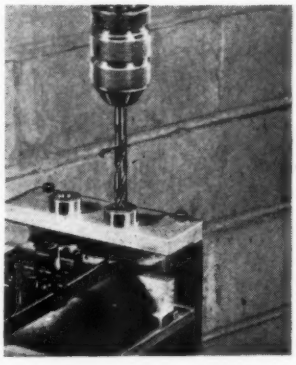
Low Height Truck

19 The Shipper is a short fork truck capable of handling 2000 lb and up to 48 in. loads, enabling it to work effectively on docks and in storage areas too crowded or small for ordinary fork trucks. Its low collapsed height of 68 in. permits easy entry into refrigerator cars, motor trucks, sub-standard factory or warehouse doors and other low-clearance portals. Tiering to ceiling heights in refrigerator cars and motor trucks, is also possible with the Skylift Shipper, because its telescopic lift is designed so that the forks and uprights are raised independently by separate rams. Hence, the forks raise to 58 in. before the uprights begin to extend. Maximum lift is 108 inches. Automatic Transportation Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

Drill Reamers

20 Drilling and reaming in one continuous stroke is now possible with the high speed drill-reamers. They are now offered in 5 standard sizes ⅛, ¼, ⅜, ½ and ⅝ diameters. The Drill section of the standard drill-reamers provides for efficient drilling through materials of any thickness up to that equalling their diameter. They also have liberal allowance for grinding the drill point a number of times. The reamer section is designed with teeth of unusual shearing qualities which are so arranged as to preclude chatter and expel the fine wool-like chips into the main flutes of the tool. Drill-Reamers are best suited for short, thru holes, where it is possible to complete the drilling function before the reamer section begins to finish. Drill-Reamers having longer-than-standard pilot drills are furnished to order for thicker materials and also solid carbide are furnished to order when required. Severance Tool Industries, Inc.



Hydraulic Coupling

21 Cartridge-mounted shaft bearings are designed as an integral part of this new hydraulic coupling. An important design feature, the shaft-end bearings in the drive coupling itself, assure permanent shaft alignment, prevent shaft play and possible damage to Neoprene bellows seals and subsequent oil

(Continued on page 16)

what "FULLY AUTOMATIC" means to you

when you buy THERMOBLOC

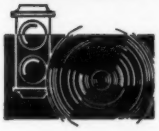
DIRECT-FIRED UNIT HEATER

THERMOBLOC is really a "fully automatic", direct-fired unit heater, occupying a floor space of only 30" in diameter and delivering 550,000 b.t.u's of draft-free air delivered at working level.

THERMOBLOC'S "fully automatic" feature requires not one, but three controls for regulating the unit. No part of its operating cycle is left to chance. This automatic operation is highly desirable in larger plants where several THERMOBLOC units may be located approximately 100 ft. apart to provide an even distribution of heat, or, localized heat for special operations.

Furnished as standard on all THERMOBLOC units are the following controls:

1 Mercoid Visiflame . . . keeps a constant watch on the flame and immediately shuts off the burner if required.

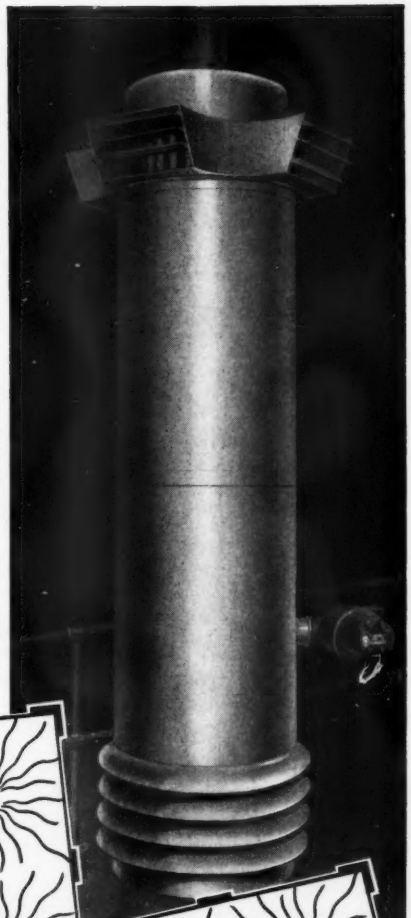


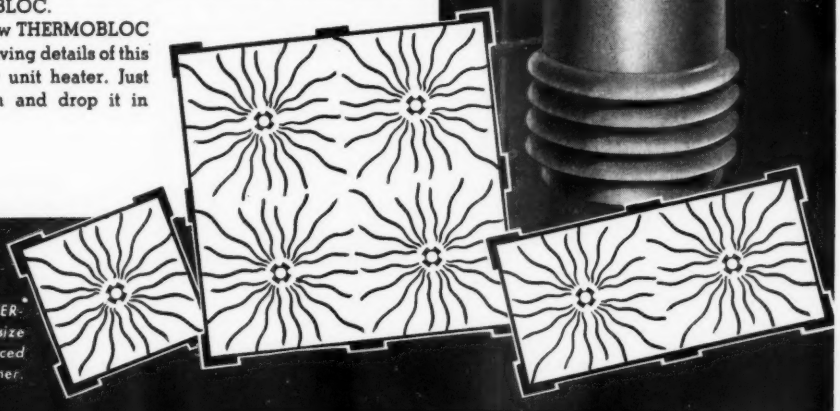
2 Fan and Limit Switch . . . controls operation of the forced draft fan, permitting it to operate only after proper air temperature is reached. This feature prevents circulation of cold air during "warming-up" periods. This control also automatically shuts off the burner if air supply is interfered with. The fan and limit switch incorporates a "summer switch" when THERMOBLOC operates as a circulator of cool air.

3 Thermostat . . . may be placed at any point in the room and acts as a control mechanism for regulating room temperature.

Thus, with these three automatic control devices, THERMOBLOC requires no attendance . . . no need for worry about the safety of your plant . . . there is never a doubt as to the efficient, economical operation of THERMOBLOC.

Write for the new THERMOBLOC Bulletin No. 300 giving details of this revolutionary new unit heater. Just fill in the coupon and drop it in the mail.





These floor plans illustrate method of THERMOBLOC installation, depending on size of plant. THERMOBLOC may be placed against the wall or even in a corner.

THERMOBLOC DIVISION

PRAT-DANIEL CORP.

72 Water St., E. Port Chester, Conn.

Thermobloc Division

PRAT DANIEL CORPORATION

72 Water St., E. Port Chester, Conn.

I would like to have further information on the New Thermobloc Unit Heater. My heating requirements are sq. ft. floor space.

NAME_____

COMPANY_____

ADDRESS_____

It's DIFFERENT!...It's a

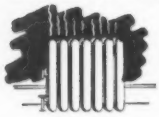
C-W SEALEDPOWER

TOTALLY-ENCLOSED....FAN-COOLED MOTOR

SAVES 80% OF MAINTENANCE COSTS

DIFFERENCES you can see in the Motor ...and in your Cost Sheets

OUTSIDE FINS DISSIPATE HEAT LIKE A RADIATOR!



To get heat away from a Sealedpower motor Crocker-Wheeler applies the proved principles of your home radiator. Actually, the graceful *outside* fins that identify this motor add over 150% more area to "give off" damaging heat! Only a C-W Sealedpower motor has these external fins. A common-sense reason why it runs cooler, longer.

INTERIOR HAS NO "OVEN" TO KEEP IN HEAT!

Double walls are essential to *hold heat* in an oven. Not so good in a motor where the problem is to let heat *escape*. An oven is an unhealthy place to keep insulation on motor windings. So there's plenty of *cooling-sense* in the Sealedpower design that *eliminates the conventional extra* outside wall around the housing... without sacrificing protection. No motor of its type is more effectively sealed against airborne dirt, oil, moisture and fumes!

NO PLACE FOR A HEAT-HOLDING BLANKET TO BUILD UP!

When lint or dirt collects between the outside wall and the housing of a conventional enclosed motor, you get the general effect of the insulating blanket between the walls of your house. *It holds heat in.* Without a double-wall, and with all dirt sealed out, a Sealedpower motor keeps cooler because it keeps cleaner, *especially on dirty jobs!*

KEEPS CLEANER... ELIMINATES 2 OUT OF 3 CLEANINGS!

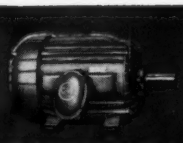
In normal (not extra dirty) service a conventional enclosed motor requires cleaning *every year,* say maintenance chiefs. A Sealedpower needs it only *every three years!* Where lint or dirt is excessive, the conventional type often should be cleaned *every 3 months,* while a Sealedpower motor will need it only *every 18 months!*

And, to clean a Sealedpower used in *normal* service only 2 simple operations are involved... taking only 15 minutes, without a shutdown. It's a money-saving cinch! Just compare it with the job of cleaning the conventional type, requiring as many as 17 operations and a 3 hour shutdown. See why a Sealedpower motor saves 80% and more of maintenance costs!

You get dollar-saving design only when you specify *C-W Sealedpower* for totally-enclosed, fan-cooled motors. Specify the *different* Sealedpower motor... with a rugged, rust and corrosion resisting cast iron frame... in *ratings from 3 to 40 hp,* horizontal or vertical, with NEMA "C" face, "B" or "D" flange mountings. Many ratings are stocked... see C-W's weekly Stock Sheet.

FOR ANY APPLICATION WHERE EXCESSIVE MAINTENANCE IS INDICATED
—specify SEALEDPOWER and SAVE

Protected-Type Motors



Sealedpower Motors

Wound Rotor Motors

Direct Current Motors

Generators

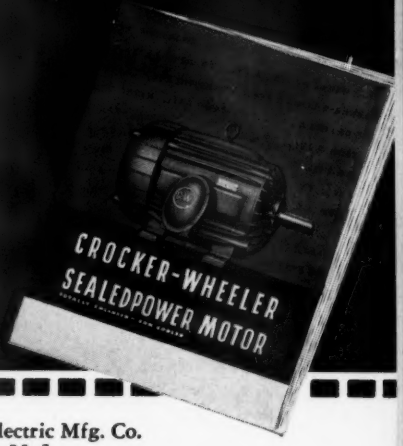
Flexible Couplings

DOLLAR SAVER!

150% MORE COOLING SURFACE
is provided by the radiating fins, exclusive with the C-W SEALEDPOWER. Here, fluttering streamers trace the fan-driven airstream that blows dust and fumes outside and away.

CROCKER WHEELER
ELECTRIC MANUFACTURING COMPANY, AMPERE 3, N. J.
A Division of The Joshua Hendy Corporation

Branch Offices:
Boston, Chicago, Cincinnati, Cleveland, Los Angeles, New York, Philadelphia, San Francisco, Pittsburgh, Washington, D. C. — Representatives in principal cities.



Before You Buy ANY totally-enclosed motor, be sure to read why SEALEDPOWER will prove a "maintenance miser" for you. This new booklet, "It's Different—it's a Dollar-saver," is packed with facts no savings-minded motor user can afford to overlook. Write for it.

Crocker-Wheeler Electric Mfg. Co.
Ampere 3, N. J.

Send the SEALEDPOWER Motor Booklet, *"It's Different—it's a Dollar-Saver".*

PE948

Name.....

Title or Function.....

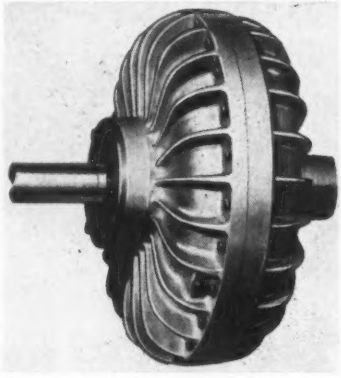
Company.....

Address.....

New Products and Methods

(Continued from page 12)

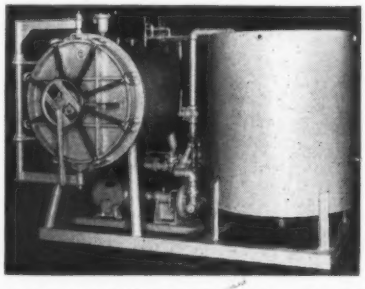
leakage. It is a completely self-contained hydraulic coupling, with simple impeller element and runner unit, mounted on its own integrally-fitted ball bearings. Straight radial vanes make possible operation in either direction with equal efficiency. Low inertia of impeller and runner facilitates quick stops and reversing duty. The unit is statically and dynamically balanced, re-



quires a minimum of mounting space and is as simple to install as a standard flexible coupling. The unit is available in two sizes: 8.5 in., with capacity up to 5 hp, and 9.5 in., with capacity up to 7½ hp. The housing is made of precision-molded aluminum alloy castings, with all mating surfaces accurately machined. CraneVeyor Corp.

Pressure Leaf Filter

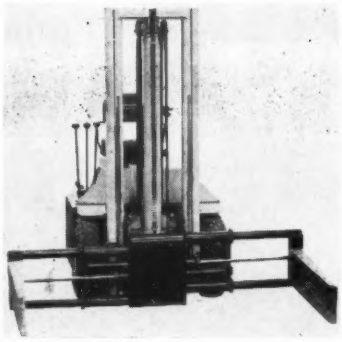
22 A 200 ft pressure leaf filter with quick-opening ball bearing door, also precoat tank, precoat and operating pumps and motor, and interconnecting lines; a complete, integrated unit ready for operational installation. Capacity 2000-4000 gph of expelled oils,



and/or 6000-8000 gph of solvent extracted miscella. Note completely enclosed vaporproof, non-hazardous filter tank body. This picture shows a filter and precoat tank steam jacketed for operation at elevated temperatures; welding done under ASME code. Hercules Filter Corp.

Lift Truck Attachment

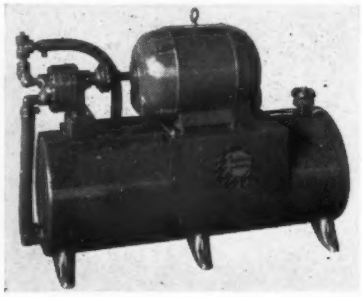
23 Versatile advancement in palletless materials handling is the new Load-Grab for use with two smallest of the company's line of seven gasoline powered, pneumatic tired trucks has been announced. Designed for an efficient handling capacity of 1,780 lb on the Model 20 and 3,350 lb on the Model 40, the Load-Grab arms will squeeze-grip bales of cotton, rags or wool, cartons or boxes, drums or barrels with equal facility. The steel arms are operated and hydraulic controlled from a lever at the driver's right. They spread from a minimum 17 in. to



a maximum 62 in. on the "20" and 66 inches on the "40," and can be lowered to within six inches of the floor. An adapter plate will permit lowering standand Load-Grab arms or standard lift forks to ground level. Optional sets of equipment, for special application of the device, include: spikes faced arms for cluthing wooden boxes and crates, rubber faced arms for particularly gentle handling, drum handling load arms for transporting from one to three drums per trip, and conventional pallet load arms. Hyster Co.

Hydraulic Power Unit

24 A new series of packaged hydraulic power units has been designed. Known as the Cubline these power units are for the application of hydraulics where forming, bending, straightening, pressing, lifting, pulling and lowering are the operating factors. The unit is comparatively small in size and therefore requires very little mounting



space. The three capacities available are 6, 10, and 15 gpm. Each power unit consists of: a 35 gal round oil storage reservoir with foot mountings; electric motor; 1000 psi Cubline gear pump; relief valve, coupling; pipe and fittings; suction hose and clamps. Hydro Power Div., Hydraulic Press Mfg. Co.

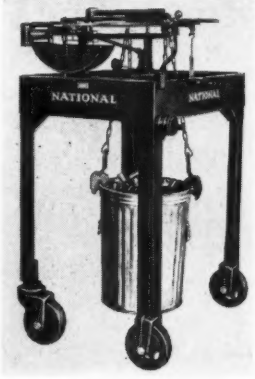
Earth Driller

25 Temporary or permanent wells are drilled at the rate of 30 ft per hr 16 in. dia with the drilling outfit illustrated, which can be mounted on any standard truck. This portable drill is designed to pull out the dirt, leaving a clean hole into which a

caisson or pipe can be inserted immediately. Temporary wells can be drilled right at the location needed, the drill moved from place to place as construction progresses. This is not a conventional type auger, but a drill with exclusive, patented features. Motor and drill are suspended from the boom, a switch is pressed and the drill starts operating. When the drill reaches the desired depth it is pulled out of the hole, carrying all of the dirt with it. KA-MO drills are used to make test holes, pilot holes for wooden, cast or poured concrete piling or posts; also for horizontal or angular holes for pipe, drains, or conduit. Drills are furnished in diameters up to 16 in, available in single lengths, or in several multiple units which can be attached as the work progresses, to reach the final desired depth. KA-MO Tools, Inc.

Weighing Scales

26 Counting and weighing scales of a new type are announced. The scales enable one man to handle bulky or heavy material by merely rolling the scale over objects to be weighed or counted. The new scales are mounted on wheels and four-foot high legs. The scale is rolled over the boxes, barrels, drums or other items to be weighed and standard grabs are fastened on. A hydraulic-lift swings the load clear of the floor, and direct weight or count readings are taken from the indicating head in the standard



way. In taking inventories the scale is rolled to the supply area and can be rolled down over a line of stored material without moving the materials with hand or lift trucks. In weighing or counting items as they leave manufacturing lines, the scale can be rolled to the line, the items weighed or counted, and then be transported to the stock room or packaging area without removing them from the scale. Models have a weighing capacity of 1,000 lb or a counting ratio of 200 to 1. The counting scales will accurately count pieces weighing one ounce or more. National Scale Co.

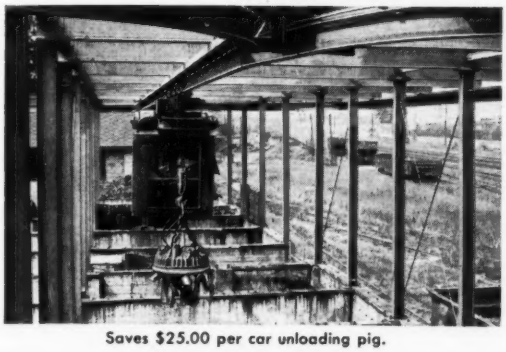
Refrigeration System

27 Announced is improved design and construction of apparatus for the No-Frost method of refrigeration for space or products, a system which, because it cools air below the freezing point of water without permitting the formation of frost or ice on refrigerant coils. The equipment consists of the fan spray cooler, which chills air and distributes it as required, the concentrator, which maintains the proper concentration of No-Frost liquid, the Aeropass condenser, which condenses the refrigerant gas and controls the head pressure at which the compressor operates, and the compressor, which may

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

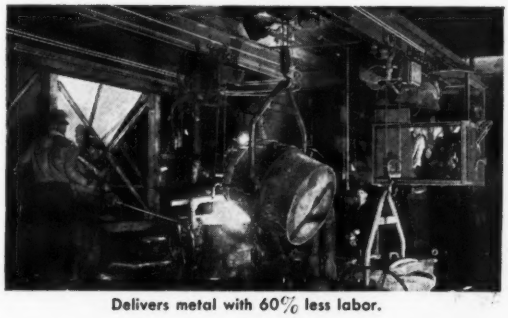
MOVE HEAVY LOADS ON MONORAIL

FOR LOWER COST HANDLING

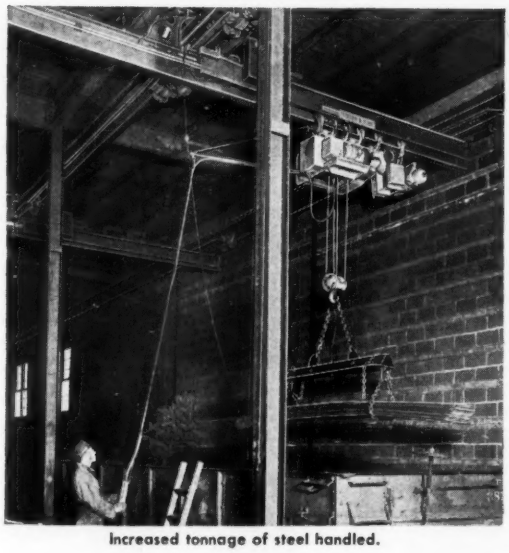


Saves $25.00 per car unloading pig.

Saves 32c per ton handling rod.



Delivers metal with 60% less labor.



Increased tonnage of steel handled.

Tough jobs to handle are naturals for Mono-Rail. Any American MonoRail system increases plant capacity and production pace, conserves skilled labor, reduces damage and accidents and SAVES YOU MONEY.

Any system, regardless of how complicated, will pay for itself in time and money saved. One company reports a savings of 86% in handling costs.

Whatever your handling problem may be, there is an American MonoRail system adaptable to it. From the simplest hand-operated unit to the most complicated fully automatic system, American MonoRail engineers can suggest a system best suited to your problem.

SEND FOR BULLETIN C-1. A 56-page book showing successful applications of American Mono-Rail Systems.

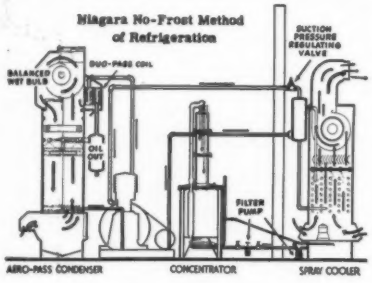
THE AMERICAN MONORAIL COMPANY

13123 ATHENS AVENUE **CLEVELAND 7, OHIO**

New Products and Methods

be any make selected by the user. These provide a complete refrigeration system that operates with a minimum spread between the suction pressure and head pressure.

In the new design a filter in the liquid line removes any dirt or foreign material that the air stream may have picked up and deposited in the liquid, and a meter-



ing gear pump is used to insure uniform delivery of the correct amount of liquid to the concentrator regardless of increased pressure resulting from the operation of the filter, and in proper proportion to the amount of condensation taking place in specific cooling or product freezing applications. When the pressure reaches 50 lb the operation is automatically shut down by a pressure switch and a warning light signals the the operator to clean the filter. Niagara Blower Co.

Industrial Counter

28 Announced is type 82-A single control register. This is a double counter. The upper set of figures, ⅞ in. high, records a count of up to 999. This total may be returned to zero at any time—at the end of a shift, a run, or the completion of a count. The lower set of

figures, ⅜ in. high, gives a grand total and is accumulative up to 99,999, then automatically turns over to zero. This register is operated by a lever at the right which may be moved by hand or actuated by any mechanism with a reciprocating motion. The counter can be fitted with a bell to ring at each operation. Ohmer Corp.

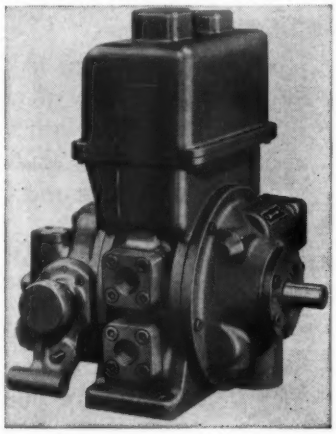
Level Control

29 Type 10CB1 introduces relatively maintenance-free level control to the chemcial processing industry. This control consists of an electric relay operating from a probe circuit through a transformer and a rectifier. Only stainless steel probe rods are located in the liquid itself. It will control the level of practically all electrically conductive liquids such as water, milk, beer, ammonium chloride, copper nitrate, sulphate, sodium chloride, potassium hydroxide and other acids, bases, and salts. The probe circuit may be set at several different sensitivities. As a result it will discriminate between a liquid and its foam, which is of particular importance in handling dairy products and penicillin. It is not affected by the saturated vapor above a liquid in a closed tank permitting positive control of acid in batch processing.

Type 10CB1 is a floatless level control containing no vacuum tubes and operating with low voltage in the probe circuit. Stainless steel probe rods are installed in the tank with pressure-tight probe fittings. The liquid to be controlled makes or breaks contact with the probe and transmits to the control a minute electrical current at low voltage. This current controls a power circuit which operates a relay to actuate signals, valves, or pumps. Photoswitch, Inc.

Fluid Power Pump

30 The fluid power variable delivery feed pump is said to be simple, compact, electro-hydraulically controlled; easy to apply nearby or remotely, and quick and positive in action. It is automatic pressure compen-



sated. Fine and coarse feeds are adjustable over a 20:1 range. It provides from 13.1 to 265:1 variable ratios between feeding and rapid traverse speeds. Only two pipe lines are required. Oilgear Co.

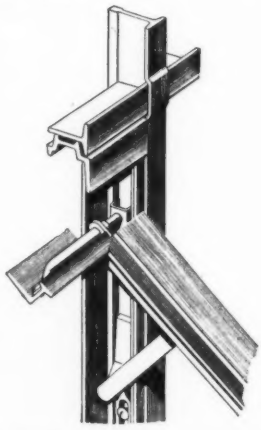
Fire Fighting System

31 A new self-contained air foam fire fighting system for flammable liquid hazards has been announced. This installation is made either as a stationary or a mobile unit. It provides quick, large-capacity, foam fire protection which may be operated by only one man. It is completely independent for it carries its own water supply, its own carbon dioxide pressure cylinder and its own supply of foam compound. It makes 3,500 gal of fire-smothering foam by automatically proportioning 10 gal of foam compound into 200 gal of water. The foam is made by a foam playpipe connected to a hose or by a stationary foam maker in the case of fixed installation. Equipment

is approved by Underwriter's Laboratories and Factory Mutual Laboratories. Pyrene Mfg. Co.

Factory Sash

32 Lok'd Bar Factory Sash are now made with ventilators commercially projected for use with standard interior screening on windows in industrial plants. Projected ventilators are complete frame and casement units with intersecting joints, strengthening the sash where the void is left to receive them. They are solid welded at the corners and their weatherings are an integral part of the section, closing on wide double contact surfaces without the use of extra attached strips.



The projected ventilators open outwardly, on heavy steel arms that balance their weight in any selected position. Brass guides, attached to the ventilator, slide in the frame channel as the ventilator opens. The correct tension on the slide is given by a coil spring enclosed in a brass housing, holding the guides in true position. When preferred, inward opening projected ventilators for use with standard outside screening are available. All ventilators may be operated either manually or with electrically controlled gearing. Hope's Windows, Inc.

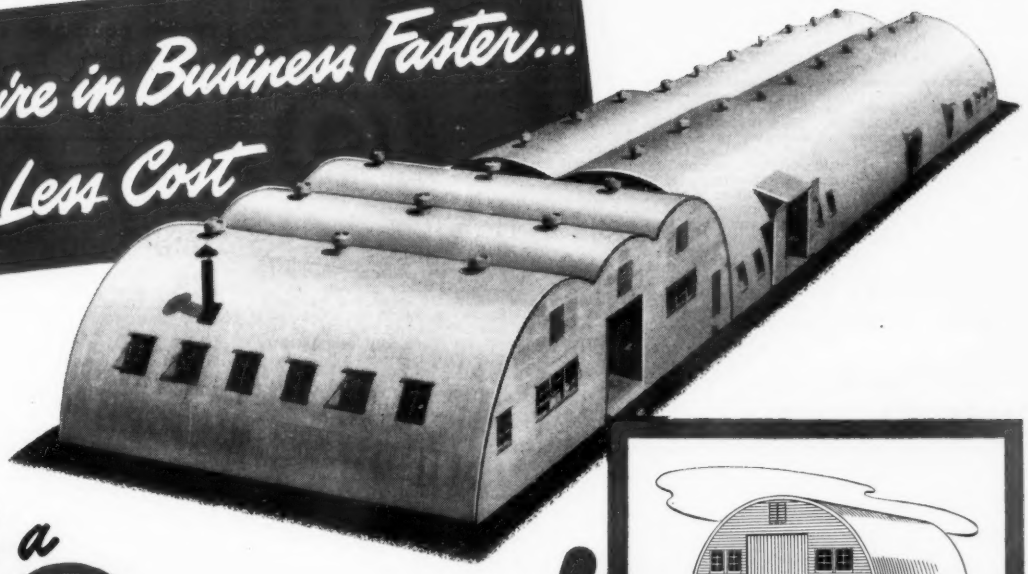
Unit Heater

33 A unit delivering 550,000 Btu per hour with No. 3 type fuel oil or with gas, the Thermobloc operates at 80 to 85 per cent efficiency.

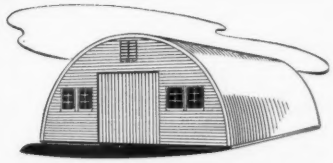
The floor space required for each unit is 30 in. dia, which is sufficiently limited to

permit the unit being installed in locations which will not interfere with the operating area. The heated air from such units is delivered without excessive velocity and consequent draft to the working level for immediate comfort at this level, instead of the slower build-up of heat from

You're in Business Faster... at Less Cost



with a QUONSET*!

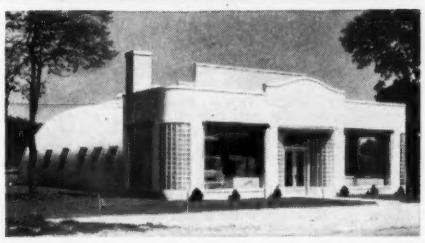


This is the basic Quonset 40—40 feet wide and as long as you like, in extensions of 20 feet. Your choice of interior and exterior collateral materials can be added to it. Five other basic Quonsets are available—the 20, the 24, the 32, the 36, and the Multiple.

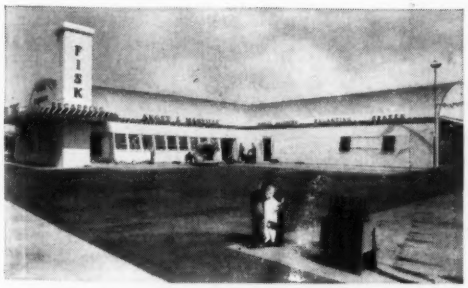
Do you want to start—or expand—a business? Go modern with Quonsets! Quonsets go up in days instead of months. And Quonsets give you much more for your money – all-steel construction, strength, fire-resistance, freedom from sag, warp and rot. They're factory-fabricated with Stran-Steel framing that has the exclusive, patented nailing groove to which exterior steel sheathing and any desired collateral materials are *nailed*.

There's a Quonset of the right size and type for your business. See here a few examples of the way Quonsets can be adapted for a wide variety of business uses. Then see your Quonset dealer—or write or wire for his name and address.

*REG. U.S. PAT. OFF.

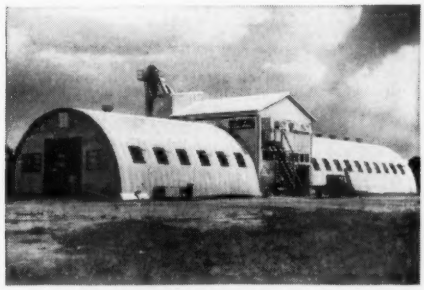


A smart commercial adaptation of the Quonset 40.



Business is good in this Quonset 20 service station.

YOU NAIL TO STRAN STEEL FRAMING



Two Quonset 40's are used in this industrial building.

GREAT LAKES STEEL CORPORATION

Stran-Steel Division • Dept. 80 • Penobscot Bldg. • Detroit 26, Mich.

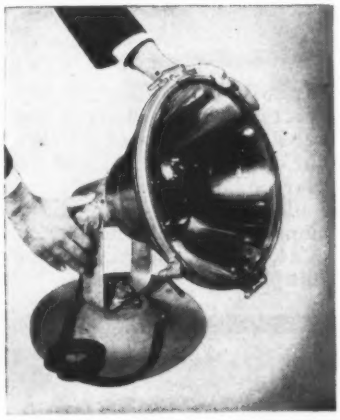
A UNIT OF NATIONAL STEEL CORPORATION

the ceiling down to the useful level, as with steam radiators. This feature makes it possible to save considerable in heating cost.

Thermobloc is said to be completely automatic and requires no attendant. It is shipped ready for operation after a fuel, electrical and exhaust gas connection. Accurate control of heated air quantity and temperature permits the use of one or several standard units for drying purposes as well as ventilating. During the summer months the air fan can be operated for withdrawing the cold air at the floor level and blowing it to the normal working level. Thermobloc Div., Prat-Daniel Corp.

Floodlights

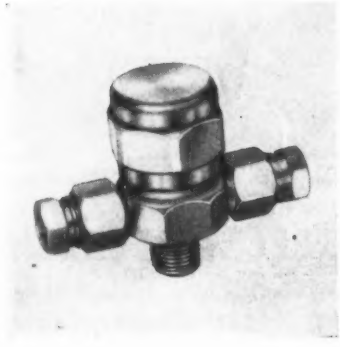
34 Two general purpose floodlights designed for small area lighting have been announced. The new lights, Type L-82 rated at 300/500 w and the Type L-83 rated at 750/1000 w, can be used for all purposes. A tightly sealed hinged door, which is locked by three clamping lugs, replaces the clamped ring on older types. A new aluminum reflector designed for higher beam efficiency in accordance with NEMA standards, and a locking handle on the elevation adjustment which eliminates the need for using wrenches, are other features of the new lights. Both the L-82 and L-83 can be provided with a portable base as well as the slip fitter and pipe clamp mountings. The portable base, which measures 14⅛ in. dia, is made of steel with a hot-dip galvanized finish. Lighting and Rectifier Div., General Electric Co.



Lubricator Valve

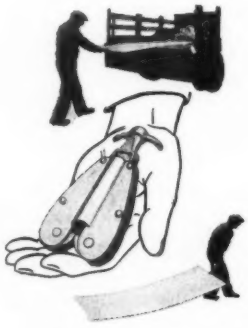
35 A new lubricator valve that delivers a positive metered amount of oil or grease to each bearing in lubricating systems has just been announced. Known as the Grannan Lubricator, it dispenses all lubricants from light oil to heavy greases through the same valve without alteration. It is a fully hydraulic, through flow valve, with no pockets or crevices to retard lubrication. The valve is completely inclosed to prevent leakage and to eliminate possibility of contamination to the lubricant from outside sources.

The lubricator will function either with hand operated guns or from a completely automatic system set to operate at any desired interval. Operating temperature is from zero to 300 F. Titeflex, Inc.



Steel Handler

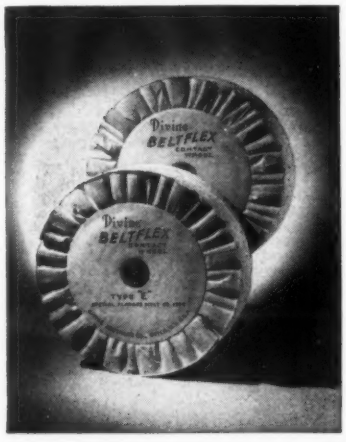
36 A useful and handy aid to anyone handling sheets, plates or other flat surface articles, is the Strong Finger Grip.. It is only 6 in. long and 3½ in. wide, weighing 28 oz; a convenient handle bar which permits it to be carried between the first and second fingers is provided. It is a device for shop men to handle sheets, plates or other flat surfaced items around the plant.



This clamp can be furnished with an Eye in place of the hand handle, if required, to attach to conveyor system or some mechanical lifting arrangement. It works on the two way wedge and level fulcrum principles, the object held cannot be made to slip on any object upon which its jaws can obtain a grip. Merrill Brothers.

Contact Wheel

37 A new contact wheel for abrasive belt polishing has just been announced. Called Beltflex, the wheel has been designed to eliminate the necessity of using buff sections under abrasive belts. The wheel is said to have all of the advantages of the buff sections, plus controlled balance and density, and a smoothly ground surface, which makes for uniform belt tracking. It is available for prompt shipment in two degrees of density—one, Type E, offering great flexibility, the other, Type G, flexibility with aggressive cutting action. Face widths and diameters for most requirements are available. Recommended for use with J weight (jeans cloth) abrasive belts. Divine Brothers Co.



Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 50-51

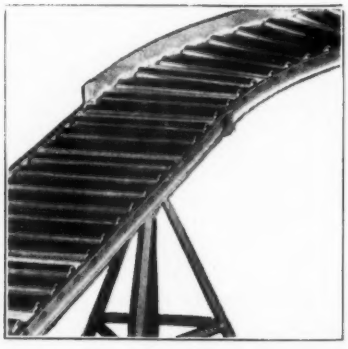
Time Delay Relays

38 New series 11400 a c and 6400 d c time delay relays are available. These relays have a planetary differential and capstan type clutch mechanism which is designed to drive the switch actuating arm when the clutch holds the third element of the differential stationary. Mechanical amplification of forces obtained in the capstan clutch allows the use of a small electro magnet, thus reducing the operation current and size of the unit considerably. Almost any time delay interval is made possible. Exceedingly compact and with a weight of approximately one pound, their design permits modification to specifications for individual applications. A. W. Haydon Co.

Dual Roller Conveyor

39 This tripod supported, dual purpose conveyor is built with the roller axles off center in the frame causing the rollers to extend well above the edges of the frame for handling loads wider than the conveyor when it is used right side up. When it is flipped over, the frame extends above the rollers form-

(Continued on page 22)



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DO YOU NEED extra safety and longer life in fastenings? Then switch to *Monel** fastenings. *Test their performance for yourself!* Just let us know the type and size you need. We'll send you a sample and refer your inquiry to your nearest distributor. All types are readily available from stock. For a sample of the Anchorfast nail and list of distributors, write to Mr. Bob Johnson of Inco.

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THE INTERNATIONAL NICKEL COMPANY, INC. *67 Wall Street, New York 5, N. Y.*

New Products and Methods

(Continued from page 20)

ing a continuous guard rail that prevents small items from falling off.

Exclusive labyrinth ball races in the wheel bearings of the galvanized rollers retain the original lubricant and keeps out dust and water. Standard lengths are 5 ft and 10 ft, with 5, 8, and 10 ft curves furnished in 450 and 90 deg angles. Metzgar Co.

Quieting Blankets

40 Fiberglas blankets are available for quieting self-contained air conditioning units. Installed in the interior of a unit and its adjacent plenum chamber, the blankets help to absorb sound waves before they reach the ducts. The blankets will not burn. Even under conditions of extreme humidity, moisture absorption of fibers is less than 1 per cent by weight. The blankets have high thermal insulating efficiency, and their use greatly reduces sweating on cabinet surfaces.

Special adhesives are used to hold the blankets securely to practically any surface. Light in weight and flexible, the blankets are cut to size and shape as easily as paper. Available in ½ in. and 1 in. thicknesses, in rolls 54 in. wide and 25 and 50 ft. long. Weight is 21 one-thousandths of a lb per sq. ft. Owen-Corning Fiberglas Corp.

Sketch Sheets

41 Announced are new sketch sheets with cross section ruling that will not reproduce. The sheets may be used for blue-printing, black and white, or Ozalid reproductions. It is said that the best results are achieved with a fast paper. The sheets are available in two different grades and with lines 4 by 4, 5 by 5, 8 by 8 and 10 by 10, lines to the inch. May be had with or without headings. Furnished in 50 sheet pads. Oglivie Press.

Hinged Connector

42 Available in 25 sizes, accommodating over 400 wire combinations ranging from No. 8 to 1,000,000 CM, the XTP will do practically all tap jobs. Further, the wide range of the XTP reduces the number of connector types users need carry in stock. The one-piece, hinged construction of this new connector makes for speed and simplicity in installation. It can be permanently attached to the main and left for the tap to be attached later. One end of the connector is simply snapped over the main and tightened, the other has serrated openings to which a tap can be run in any of three directions. Other construction features are; spring steel lock washers maintain permanent pressure; grip holding serrations on wire-contact surface for maximum pull out strength; non-rotating pressure plates; highly conductive copper alloy body; extra strength copper alloy hinge and pressure plates. O. Z. Electrical Mfg. Co.

Insect Control

43 In order to be effective, where insect kill is desired, liquid insecticide must be diffused into a veritable fog. This new atomizer produces a dense insecticidal fog.

The atomizer, operated by air-pressure, steam pressure, or carbon dioxide gas pressure, disseminates a dry mist of insect-killing droplets about eight microns in diameter. For this reason, no condensation is noticeable. The atomizer will turn out into the atmosphere Vaposector, in particle sizes so small that they will not wet or condense on tables, walls, or any equipment with which they may come in contact, provided the atomizer is in operation the proper, easily regulated length of time.

The atomizer has ten atomizing nozzles which dispense the insecticide into the upper and lower stratas of a room. The vapor will penetrate cracks and crevices where insects hide and breed.

The installation is actually tailored to fit any plant requirement, regardless of the size of the plant or nature of the industry.

To meet the needs of every type of industry, this company's entomologists and engineers have perfected six different types of atomizers to provide permanent insect control. West Disinfecting Co.

Washroom Service

44 A periodic service that will perform such jobs as cleaning traps, bowls, urinals, disinfecting, and servicing the deodorizing equipment is available. Plan is designed to save management the labor involved in proper sanitary maintenance. West Disinfecting Co.

Test Gage

45 Announced is a standard test gage for use with Reid Vapor Test bombs. It may also be used for any service where an accurate, portable test gage is required. Accuracy of the new Reid Vapor Test gage is guaranteed to within ½ of 1 per cent. It has the stainless Helicoid precision movement. Dial size is 4½ in and made of white laminated Phenol.

The flangeless case is Acaloy and is weatherproof with an external micrometer pointer adjuster. The snap ring is stainless steel (18-8) with Neoprene gasket. The long, stainless steel (18-8) shank has a square, and ¼ in. male pipe thread. Helicoid Gage Div., American Chain & Cable Co., Inc.

Thread Compound

46 Thread compound, Fel-pro "Hi-Temp that is said to prevent freezing and galling of metal surfaces at temperatures as high as 1800 F., is offered. The new C-5 compound was developed specifically for high temperature and pressure applications, such as furnace tube heater studs and plugs. C-5 is said to greatly minimize shut-downs or dismantling time, stop high temperature thread galling and costly stud breakage. The company states that many petroleum refineries, chemical plants, and other industries where extreme operating temperatures are encountered, are using C-5. Another important feature of the new Compound is the fact that it is non-corrosive on stainless steel and other alloy metals. A free sample can of the material is available. Felt Products Mfg. Co.

Nylon-Steel Rope

47 The Du Pont nylon coating of this coated wire rope is unaffected by oils, cleansing agents, marine growths, and all alkalies. It is further claimed that it is not harmed by such acids as nitric, hydrochloric, or sulphuric in concentrations up to approximately 1 per cent. Temperature tests show that Wirelon ropes operate well at high and low temperatures. The ropes retain their flexibility whether wet or dry.

The coating is available in three types of rope. In the first, nylon is extruded onto single strands of wire. The second type is more flexible and is made by applying the plastic to the outside of wire ropes that are already completely formed. Still more flexible than either of the other types, is nylon-wire rope made by the third method, in which individual strands are coated with nylon and the coated strands then closed into a finished rope. Available in sizes from $\frac{3}{32}$ in. and up. The plastic coating helps reduce the possibility of the rope's birdcaging, fanning out, or kinking when strains are suddenly applied, and protects against injury from steel splinters. Rochester Rope, Inc.

Overhead Projector

48 This is a new overhead projector that affords a 7 by 7 in. horizontal fully exposed projection stage upon which any transparent material, lantern slides, X-ray film, Vu-Graph plastic or accessory film, may be placed and projected. When opaque material is used it is projected in silhouette.

The Vu-Graph is usually placed on a lecture table next to the speaker. Its image is projected to a screen behind the speaker. The speaker can face his audience at all times. He can point out important features of his presentation on the Vu-Graph and can underscore, write or draw on the material being projected, without turning away from his audience. The transparency is clearly visible on the screen behind. Charles Beseler Co.

Bronze Electrode

49 Announced is the immediate availability of a new silicon bronze electrode. According to the manufacturer these electrodes may be used for the welding of silicon bronze base metal, copper and for joining galvanized iron and silicon bronze to steel. The new electrode is available in 5 diameters ranging from $\frac{3}{32}$ to ¼ in. and varying in length from 11 to 18 in. Air Reduction Sales Co.

Limited Input Welder

50 Several new, general purpose, limited input, transformer-type welders have been designed for use on single phase and other power lines of limited capacity. They are available in output ratings of 130 and 180 amps. Prices start at $155.50 complete, ready to operate with headshield, electrode holder, welding, ground and power cables, wall receptacles, and supply of assorted welding rods These welders are made for general industrial use. They have 36 secondary output current heat stages, ranging from 20 amps to their rated maximum secondary outputs of 130 and 180 amps respectively. Class B spun glass type insulation is used throughout. Trindl Products, Ltd.

Steam Line Treatment

51 This system of corrective treatment comprises two factors: The heater unit and fluid. This fluid, electrically heated in the unit, is atomized into the steam main beyond the boiler at high temperature and adjusted to the pressure of the steam system. Because its temperature is higher than that of the steam into which it is atomized, the fluid entrains with the steam which, acting as a vehicle, carries it to all parts of the system, no matter how remote from the boiler. It treats radiators, traps, return line, and steam operated equipment. Existing scale, oil sludge, rust and other products of corrosion are dissolved into minute particles and held in suspension, flowing off with the condensate. It is alkaline and non-caustic and will not injure ferrous or nonferrous metals, packings or gaskets. It neutralizes the acidity caused by oxygen and carbon dioxide, preventing the formation of carbonic acid. Unit is easily installed and is completely automatic. Operates either on 110 or 220 v ac or dc. Pressure-Jet Systems, Inc.

Shop Elevators

52 These new machines are designated as the Type DX heavy duty Shoplifter and are made in two capacities, 1000 lb and 2000 lb. Features include a framework of steel all welded construction and two new ball bearing hand power hoist units. The hoist units are of the crank up and crank down type and include such features as an automatic holding brake that does not require manual setting or releasing by the operator, a safety ratchet and pawl that also automatically holds the load, and the liberal use of ball bearings to achieve minimum friction in operation. Under the full rated capacity loads, these units only require a crank handle pressure of approximately 20 lb to elevate or lower a load. Overall framework dimensions are identical for both 1000 lb and 2000 lb capacities but the heavier machine has several reinforcing members to accommodate the heavier loads. Each capacity has its own hoisting unit. The overall height and width of the framework will allow the heavy duty Shoplifters to be taken through any ordinary doorway. The narrow base-frame width and platform, 24 in. wide, allow these machines to go down narrow aisles and work between closely spaced machines. Details include two 5 in. dia basewheels under the platform and two 6 in. dia swivel casters at the opposite end of the framework plus a push bar for easy steering across the floor. Prices from $320 to $370. Economy Engineering Co.

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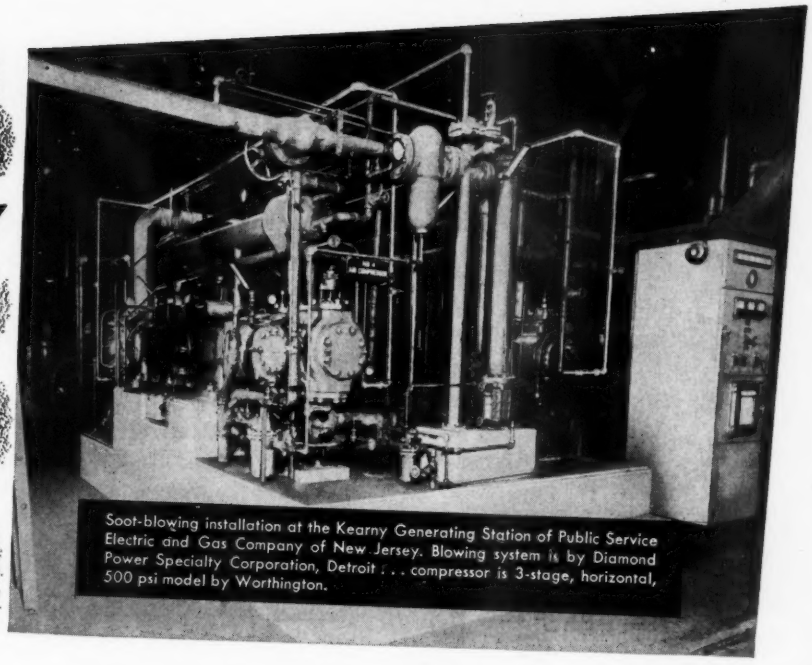

Soot-blowing installation at the Kearny Generating Station of Public Service Electric and Gas Company of New Jersey. Blowing system is by Diamond Power Specialty Corporation, Detroit . . . compressor is 3-stage, horizontal, 500 psi model by Worthington.

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At the Kearny Generating Station of the Public Service Electric and Gas Company, N. J., boiler cleaning became increasingly important, due to a rise in the ash content of the coal. Soot blowing with steam resulted in erosion of the tube surfaces. In addition, the replacement of water removed from the system required chemical treatment and pre-heating.

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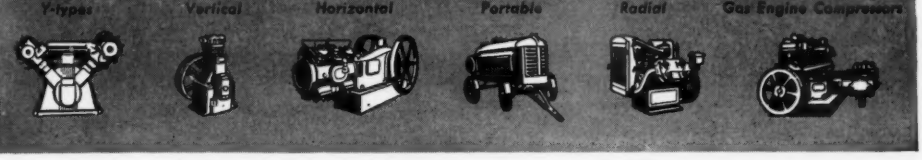

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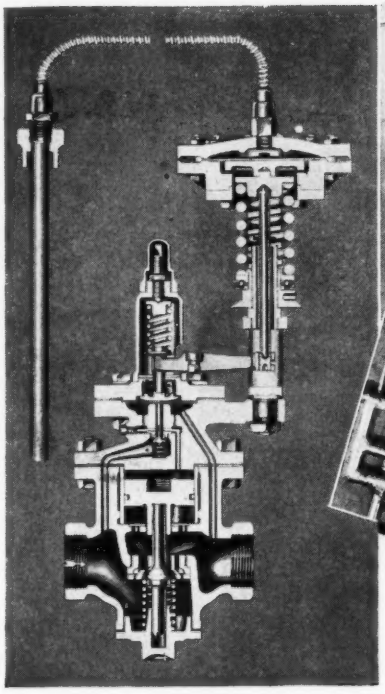

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YARWAY IMPULSE STEAM TRAP

Provide Preventive Maintenance for Elevators Also

Elevators are safe when properly protected and maintained . . . The four primary factors in adequate protection . . . Where, when and what to inspect at regular intervals . . . Leveling overspeed governors and car devices . . . Rope maintenance and when to replace . . . Lubrication requirements . . . Control boards . . . Fire prevention

By P. E. KAVANAGH, *Plant Engineer, General Aniline and Film Corp.*

SAFETY RECORDS of properly maintained elevators top that of autos, planes, or even homes which statistically are mighty dangerous places. Note especially the "properly maintained" qualification. Proper elevator maintenance is thorough *preventive* maintenance and nothing else. The following should be useful to the plant engineer who wants to set up or re-check his own elevator p.m. system.

Insurance statistics show that by far the greatest number of elevator accidents involving persons occur at elevator entrances. Most accidents are caused by inadequate or defective safety equipment at these points so the most important part of the preventive maintenance program covers this equipment.

Adequate protection includes: 1, A gate and a switch on the car so arranged that the car cannot move unless the car gate is closed; 2, a door at each landing equipped with a lock so arranged that the door cannot be opened unless the car is at the landing; 3, a switch at each landing door arranged so that the car cannot run unless the door is closed; and 4, especially in the case of push button operated elevators travelling faster than 100 fpm, a door lock equipped with a switch arranged so that the car cannot run unless the locking device is in the locked position.[1]

Each p.m. or preventive maintenance visit to the elevator must include inspection of *each* of the above features on *each* landing door, and in case any one of them fails to operate properly, the elevator *must* be taken out of service immediately and under *no* circumstances be placed in operation until repairs have been made. "OUT OF SERVICE" signs should be provided.

Next most important points are the upper and lower landing terminal stopping devices, the overtravel limiting devices and the emergency stop switch on the car.

Leveling: If the car is self-leveling, the stopping point at each landing should be checked and adjusted. If stopped by the brake at speeds of 60 fpm or more, the car, when empty, should stop approximately 1 in. above terminal landings, to prevent excessive under-or over-shooting when loaded.

Overspeed Governor: Slack-cable and overspeed governor switches should be tripped and the governor itself checked for adequate lubrication and free operation. A governor with a hard-to-operate trip mechanism may very well fail to operate when needed since certain types are not operated positively from the sheave. They are merely tripped by the centrifugal device allowing the jaws to drop into place by their own weight. On the other hand if the sheave does not turn freely the car safety may be partially set causing the safety dogs to scrape the guide

[1] See How to Maintain Motors and Generators, Part IV, by C. G. Grant, PLANT ENGINEERING, Feb. 1948, page 32.

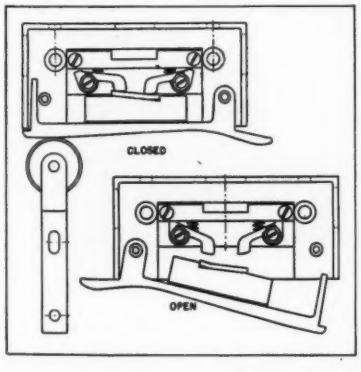


Fig. 1. Take the cover off the car gate switch and inspect carefully. At least once each month contacts should be examined for signs of burning, the springs for rust and breakage and the leads for tight connections

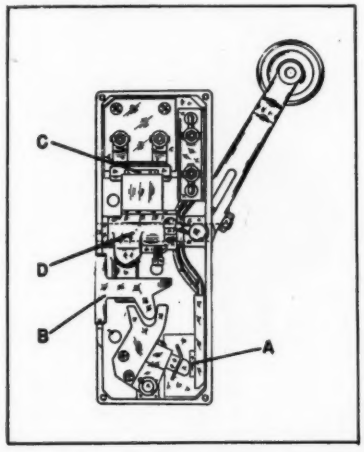


Fig. 2. Electro-mechanical interlocks contain many moving parts, contacts and parts which should be carefully examined for wear

This interlock is equipped with two switches. One of these, Switch A, is closed by latch B (mounted on the door) when the door is closed. The other, Switch C is closed by the keeper O. The arm extended down from the keeper engages a lug on the latch, locking the door. When the car reaches the landing the retiring cam moves outward, pushing against the roller arm which in turn disengages the keeper from the latch and opens Switch C. Both switches must be closed before the car can run which makes it necessary to use a cam which can be retired mechanically, instead of the fixed cam used with simple mechanical locks

Cutler-Hammer Mfg. Co. photo

Fig. 3. The retiring cam operates each time the car starts or stops. Be sure it doesn't stick or bind

The cam illustrated is retired by the torque motor mounted above it. This motor rotates approximately one-half turn, winding the short chain and holding the cam retired while in the stalled position. Solenoids are often used in the place of torque motors in this application. The dashpot and the spring stop provide retarded motion and quiet operation and reduced wear

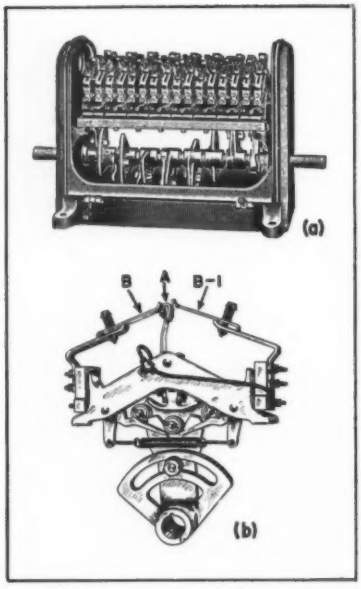


Fig. 4. Keep a few floor selector parts on hand and follow the manufacturer's instructions on lubrication

This type of floor selector is used with single call push-button operated elevators. It consists of a number of assemblies constructed (as shown in detail by the sectionalized drawing), with one assembly for each floor. Its purpose is to cause the elevator to move in the proper direction when a button is pushed. It also stops the car at the landing. Each assembly is essentially a single - pole - double - throw switch operated by the car. When the car is below the landing, the contact finger A is connected to the UP motor directional relay thru contact B; when above the landing, A is connected to the DOWN motor directional relay through B-1. When the car reaches the landing, A is no longer in contact with B (or B-1) and the car stops. A drum and suitable gearing (not shown) are attached to the operating shaft and turned by an endless tape or rope fastened to the car

rails. Considerable time with the file and a sulfur-oil mixture will then be needed to dress the rails. The governor jaws should be checked for clearance with respect to the governor rope in order to avoid safety drag and rope wear.

Car Safety: If the car safety is operated by unwinding cable from a drum, the cable should be checked for damage from chafing. The cable should be unwound by hand and the operation of the safety dogs checked by feel every 6 months, in order to insure free operation. The safety cable should be re-wound carefully, but not too tightly, as chafing may result. This operation will probably be taken care of by the insurance inspector. If not, the maintenance engineer should see that it is done.

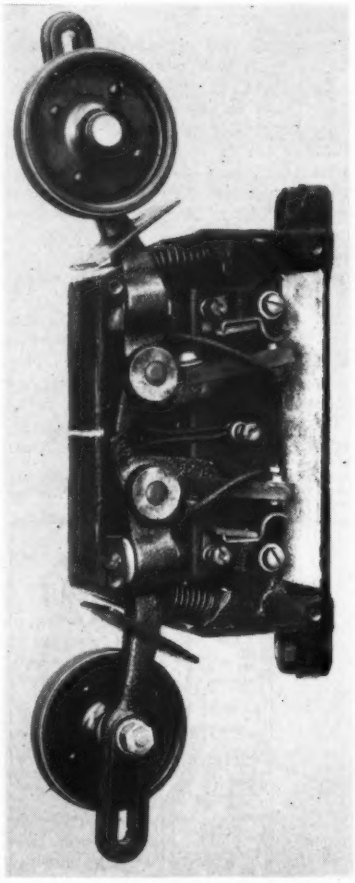
Rope Maintenance: The main hoisting ropes should be checked approximately every 500 mi, or oftener if signs of deterioration appear. Contrary to popular belief, these ropes are almost never replaced because of wear or parting due to excessive load, for the safety factor may vary from 10 to 100 or more. A foreign object lodged against them can, however, cause very serious wear. The primary cause of rope replacement is bending fatigue, commonly, and erroneously, known as "crystallization." For this reason, every effort must be made to reduce the causes of fatigue.

An elevator with many deflector sheaves and reverse bends will ordinarily have shorter cable life than one with fewer sheaves and bends. An elevator with the machine located in the basement will ordinarily have shorter cable life than a similar installation having the machine located in the penthouse, for the same reason. Good elevator engineering calls for hoisting sheave diameters to be not less than 40 times the rope diameter in order to reduce fatigue.

Space limitations, especially on sidewalk elevators, often make it impossible to attain this ratio, and cable life under these conditions is decidedly shorter. For this and reasons of electrical maintenance, it is preferable to install an inside elevator, if at all possible, rather than the sidewalk type. Steel 6x19 and 8x19 hoisting ropes are most commonly used, and the longer life of the more flexible 8x19 rope more than justifies its somewhat higher initial cost. Iron wire or hemp is ordinarily used in governor rope and tiller rope for the car safety drum.

Elevator ropes should be removed when six broken wires appear in any one strand. When installing new ropes, great care must be taken to prevent untwisting of the strands since a relatively slight loosening or deformation of the strands will result in greatly shortened rope life. For the same reason all sheave and drum grooves must be in first class condition. Badly worn or scored grooves will cause deformation or wear and should be re-faced on a lathe, or the sheave replaced.

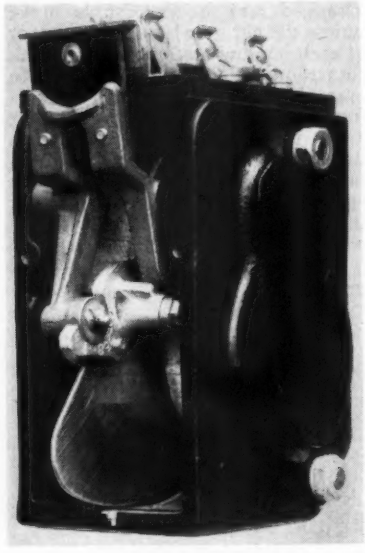
Sheaves of an elevator equipped with a rope equalizer must be watched carefully. If one groove becomes worn slightly more than the others it may be necessary to remove the equalizer. This device can accelerate the wear by causing the rope in this particular groove to



Cutler-Hammer Mfg. Co. photo

Fig. 5. Examine the double-throw (reversing) hoistway switches for wear and for burned contacts

These reversing switches are sometimes used in place of a floor selector on slow moving elevators, of 100 fpm or less, with few landings. Electrically their function is the same as that of the floor selector. They are operated by a fixed cam mounted on the car, and are arranged so that the proper directional contact is locked closed after the car has passed, but, both are open when the car is at the landing. One reversing switch is mounted at each intermediate landing, but only an ordinary normally-closed limit switch is used at each terminal landing



Cutler-Hammer Mfg. Co. photo

Fig. 6. Operate the reverse phase relay occasionally by disconnecting the power—be sure it has not set in the closed position

This relay is used with a polyphase motor to prevent running in case the line phases have become reversed. This would cause an elevator to travel in the wrong direction and probably stop on the overtravel limit. It will also disconnect the motor from the line if one of the phases has become disconnected

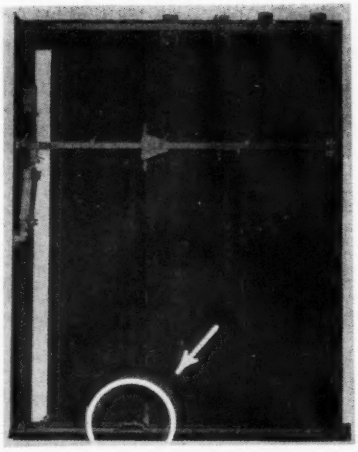


Fig. 7. Racks and pawls, when used, should be checked for breakage and loose bolts

They are used with broken-arm type hoistway door closers to prevent a person on the landing from pulling the door open after the door switch has closed but before the broken arm has reached the locked position. The rack indicated by the arrow above is shown in detail by Fig. 8

slide through the groove in its efforts to equalize rope tension. This sliding will wear the groove still further and making the sliding more pronounced.

If a traction sheave is re-grooved, the hardness of the new groove faces should be checked to make certain that the case-hardening has not been penetrated. Failure to do this can result in much rope wear and sheave wear.

It is seldom necessary to lubricate elevator ropes, as they are constructed with a hemp core saturated with oil at the time of manufacture. The core releases oil to the strands during the life of the rope. It may, however, be advisable to oil old ropes on an elevator which is not used frequently.

All rope fastened in babbited sockets should be arranged so that the hemp core remaining after turning back the steel strands is left dangling in full view. This makes it possible to determine whether sufficient strand was turned back in making the connection.

All mechanics and inspectors should be specifically warned *not* to inspect ropes by sliding their finger along them while the car is in motion. They will almost certainly receive very painful, and sometimes serious lacerations. The only safe way is to use a flashlight and stop the car frequently.

Machine Lubrication: Lubrication

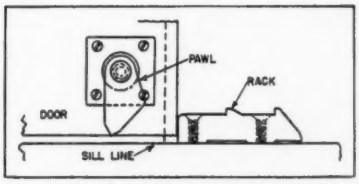


Fig. 8. Details of the rack and pawl indicated by the arrow in Fig. 7

The rack is installed so that the pawl passes the first ridge before the door switch closes; the door can not then be opened until it has reached the fully closed position, allowing the pawl to drop to the vertical position. When fully closed, the broken arm prevents the door from being opened from the outside

of sheaves, motor, and especially of the worm gear, should be checked. A properly lubricated worm will run for years showing little wear.

The gear oil should be checked for consistency or feel and appearance at each inspection. If it becomes thin, discolored, or dirty, it will pay to drain it out and flush the gear housing thoroughly with kerosene until the kerosene becomes clear. Then fill with new gear oil. If the oil needs changing quite frequently, say every 400 mi or less - it will pay to try other brands of elevator gear oil. There is a great deal of variation in the quality of lubricants.

Control Board: The control board should be checked for such things as burned contacts, frayed pigtails, sticking or worn contactors. Burned contacts should be sandpapered unless made of silver. An adequate inventory of replacement contacts, coils and pigtails, should be maintained.

The floor selector, or hoistway reversing switches, should also be checked. Some lubrication is required. If the selector is equipped with snap-acting switches, the switches should be checked for wear. If they are of the slow-break type, the contacts should be watched and, when recommended by the manufacturer, lightly coated with vaseline.

(Continued on page 49)

[2] Equipment used for illustration are: Figures 1, 2 and 9, G.A.L. Electro Mechanical Service, New York City; Figures 7 and 8, Elevator Supplies, Inc., Rahway, N. J.; and Figures 3, 4, 5 and 6, the Cutler-Hammer Mfg. Co., Milwaukee, Wis.

ELEVATOR INSPECTION FORM

Elevator Location ..... Mfgr. ..... Type .....

Motor ..... Rope Drive ..... Capacity .....

Control ..... Speed (fpm) .....

Equipment	Date of Inspection						
Hoistway door locks							
Hoistway door switches							
Hoistway door interlocks							
Racks and Pawls							
Car gate switch							
Car stop switch							
Car controller							
Car leveling							
Overtravel limit switches							
Slack cable switch							
Overspeed governor							
Overspeed governor switch							
Overspeed governor rope							
Car safety							
Car safety (tail) rope							
Hoisting ropes							
Floor selector rope (or tape)							
Motor							
Brake							
Gear - lubrication							
Control board							
Floor Selector							
Retiring Cam							
Door operators							
Signal System							

Suggested elevator inspection form. At the time of inspection the date and O.K. or X should be entered on the form in the proper place. The reason for the X should be written on the back to give a permanent record

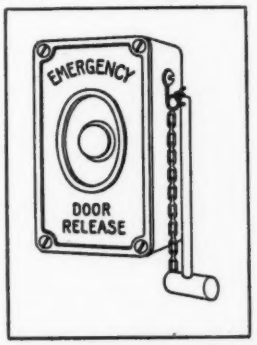


Fig. 9. If elevator car is equipped with this type of switch, check the glass at each inspection

To Reduce Costs Use Modern Handling Methods

By WILBUR G. HUDSON, *Consulting Engineer, Chicago, Ill.*

Handling represents from 10 to 75 per cent of direct labor payroll, a large portion of which can be saved by proper use of conveying equipment . . . Floor level and overhead transport . . . Industrial trucks, investment, operating costs and potential savings . . . Sand recovery in a foundry . . . Potential failure due to poor selection of capacities . . . Handling granular and pulverized materials . . . Dust explosion danger . . . Continuous flow and pneumatic conveyors

WITH CLIMBING COSTS in these difficult days the possibilities in modern methods of materials handling warrant attention. Lower handling cost is reflected throughout productive and non-productive operations all the way from the mines and quarries, through the shops, to the shipping platform. As compared with manual handling the cut in handling cost through mechanization seldom is less than 25 and sometimes exceeds 90 per cent. These comparisons come from the cost findings of manufacturers who have accurate cost records.

Handling represents from 1/10 to ¾ of the direct labor payroll. Too, it has been found that of the time during which materials are in the average plant at least 70 per cent is consumed in handling and holding them in storage, a major source of wastes and potential economies. Although direct handling-cost reductions will amply justify the adoption of mechanical handling, these are but a part of the tangible dollar return. The corollary profits from smooth material flow, such as saving in lost time of skilled machine operators, fewer accidents, lower compensation payments and less damage may be greater.

For horizontal movement through the shops available equipment has reached a high state of development in both floor-level and overhead transport; the former through live and gravity roll conveyors, as typified by Figures 1, 2 and 3, and, through industrial trucks; the latter by trolley conveyors as shown in Figures 4 and 5.

Overhead transport is well illustrated by Fig. 4, a Link Belt installation. Figure 5 shows a runaround with special hangers for several shapes of enameled steel sections. The drive sprocket is on a vertical shaft. Chain adjustment is by a movable track section at the right. Some conveyors of extreme length are driven by one or more boosters, that is short runaround drive chains with lugs which engage the conveyor chain links. The corner wheels thus become idlers and chain wear is eliminated.

For moving unit loads vertically up or down there are several types of elevators and lowerers. Some of these are shown by Fig. 6, by Fig. 7, a Gifford wood installation and Fig. 8, a Link-Belt installation. Tray elevators and lowerers are in a wide variety of sizes, from the light machines handling trays in restaurants and books in libraries, to the massive installations for rolls of paper weighing 2 t each. The path may be vertical, inclined, a lift followed by a horizontal run, or, a runaround in a vertical plane. Any of these may be provided with auxiliary loader and unloader. The operating speeds are low, usually less than 50 ft per min. They have long life with low maintenance. About the only risk is the jamming of a misplaced load. A simple protection is a shear-pin in the drive supplementing the usual overload release.

Industrial trucks of many types find wide application. High lift trucks apply when the loads are to be piled or tiered. Low lift trucks are applied when the materials are to be deposited

Fig. 1. Roller flight conveyors saving man-hours

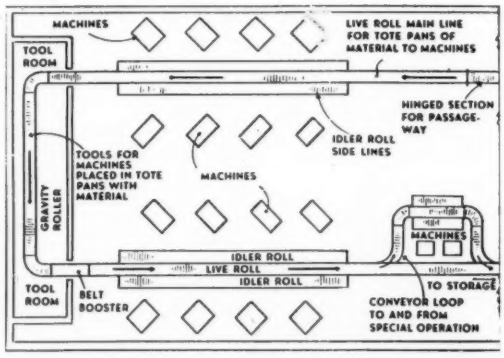


Fig. 2. Application of roller conveyors in a machine shop
Parts in tote boxes enter at the upper right on live roll conveyors, paralleled by idler rolls on to which the boxes are transferred for the first machine operation. Movement is then through the tool room, where jigs and fixtures for the next operation are placed in the boxes with the material before boxes pass on to finishing operation

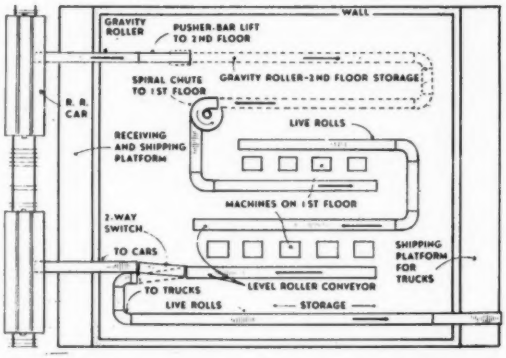


Fig. 3. Roller conveyors for loading and unloading cars
Material from the cars moves into the building on gravity rollers and then by means of a 45 deg pusher bar lift to the second floor storage. Material from storage is lowered by a spiral chute to gravity rolls serving the machines. Following the machines a two way switch permits movement of the material to the cars, to the truck loading platform or to storage as required

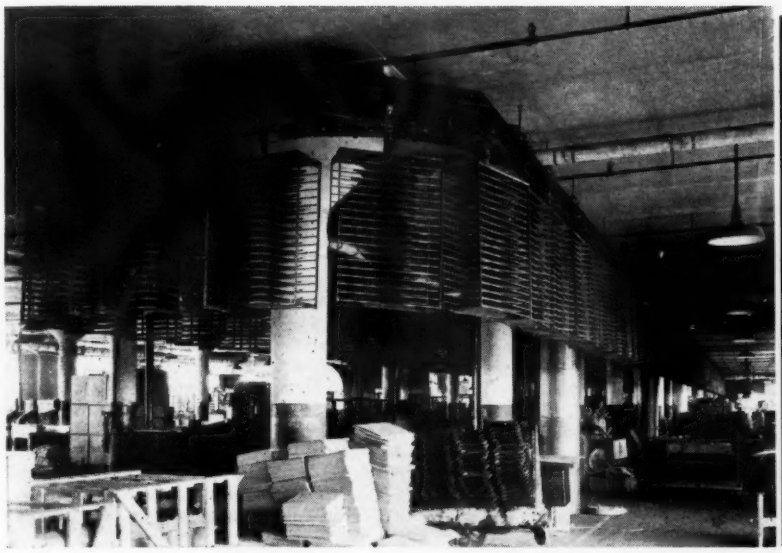


Fig. 4. Overhead conveyor for handling wooden chairs during drying of the finish. The chain trackway may dip down at one or more points for loading or unloading

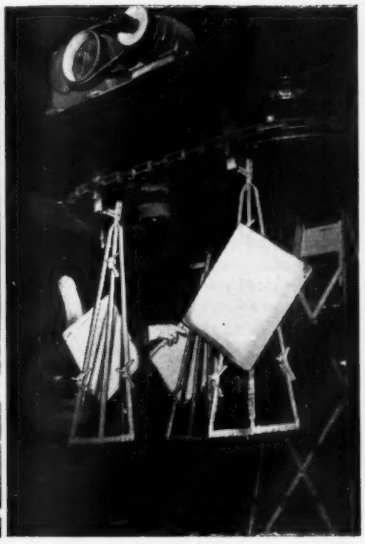


Fig. 5. A runaround with special hangers for sheets of enameled steel

on the floor. If the distances involved are moderate and the traffic volume small, the manually raised and propelled truck suffices. Several motorized hand trucks now have power lift as well as traction. For greater capacities the power-operated truck, either with gasoline engine or storage battery and motor, and with the operator riding the truck may be selected. Speeds loaded range from 400 to 600 ft per min. Equipped with mast and power lift the standard high lift truck will stack boxes, crates, etc., as high as 12 ft.

The tractor-trailer system works in nicely where larger quantities of materials are to be collected at one point and moved to other points, as, to and from railroad cars. The tractors form the trailers into trains, transfer them and drop them off at designated points. One tractor may suffice for several trains as the tractor is freed from time loss while the trailers are being loaded or unloaded.

Cost-savings through the use of industrial trucks can be only approximated since, unlike other mechanized equipment so much depends on the men or women available for training as operators. Aside from direct savings are the economies in production and storage areas because of layout possibilities, decreased congestion and higher tiering, unobtainable with manual handling.

Our discussion has been in connection with unit loads. The handling of pulverized and granular materials is a different proposition. Available are the various types of highly developed mechanical and pneumatic conveyors, any of which when properly applied will assure continuous operation with low maintenance costs and long life expectancy. Figure 9, a Link Belt installation is an illustration of how engineering study of the possibilities secured savings which the owners state paid for the installation in 2 yr operation.

Here, a Southern foundry with an output of 14 t per 8 hr day of steel castings weighing from 6000 lb down

Fig. 6. A lowerer for steel drums. An unloader upends the drums to a gravity roll conveyor in the foreground. A variable speed drive provides the proper time interval between loading and unloading

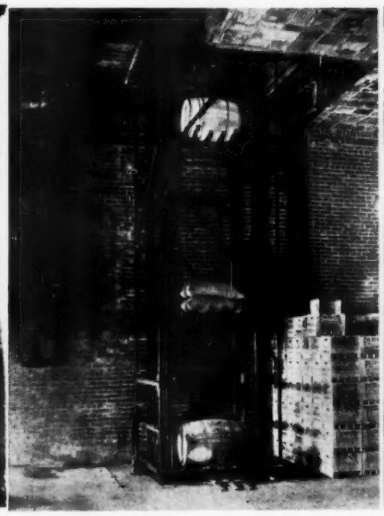


Fig. 7. A tray elevator for bags and barhels. Loads placed on the forks are lifted off by the slowly ascending tray forks and carried to be chuted off by adjustable inclined forks registering with tray forks

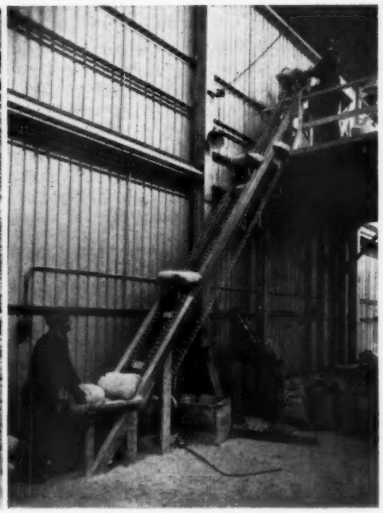


Fig. 8. A simple and inexpensive inclined tray elevator for bags and small kegs, manually loaded. Automatic loading is readily provided. The elevator has two strands of Ewart chain with spaced carriers

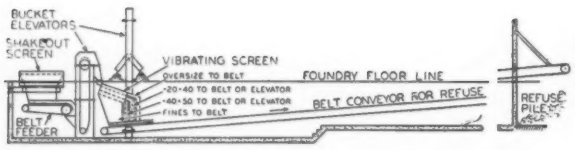


Fig. 9. Modernized sand shakeout and reclamation scheme for an iron foundry

to a few pounds each, suffered considerable loss in used sand not suitable for use again without some method of reconditioning. The flasks were dumped on the floor, with little of the sand re-used. The installation shown reduced the force from 18 ladle and shakeout men to 10 ladle men. Between heats the ladle men shake out the molds of previous heats with the aid of an overhead crane. About 75 per cent of the sand is recovered, 25 per cent for back-up sand and 50 per cent for facing.

The shake-out screen is mounted above a collecting hopper with a belt feeder to deliver the sand uniformly to an elevator which discharges to the classifying screen, a triple deck vibrator. The waste material consisting of gaggers, metal fragments and lumpy material, discharges over the end of the top deck to a 135 ft refuse belt conveyor. The fines that fall through the bottom deck also is waste and disposed of by the same belt.

Back-up sand is obtained from the end of the intermediate deck. The facing sand is reclaimed as the material passing over the end of the bottom deck. The sand-collecting chutes from the end of the intermediate and bottom screening decks are equipped with cut-off gates to permit feeding these materials to the taller elevator which forms a stock pile on the floor alongside the sand mixer. This matter of sand reclaiming is important now with the growing use of aluminum and magnesium castings which require a high grade, costly silica core sand.

Sometimes the requirements of practical design are not recognized either by the purchaser or the seller, and trouble follows. Fig. 10 shows an instance of failure to understand the rather obvious. Mine cars from the mine load coal to railroad cars. The coal passes first over a shaker screen to cull out about 10 per cent of dust and fines. The mine dump rate was stated to be 200 t per hr, so a belt conveyor and elevator good for 35 t per hr were specified for the screenings.

So long as the stated conditions held, the installation functioned perfectly. However the men back in the mine occasionally cleaned up small stuff and the mine cars issued with loads nearly all of which passed through the screen. The conveyor and elevator capacity should be 200 t per hr rather than 35.

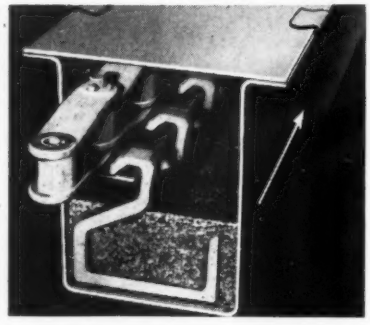


Fig. 11. A horizontal runaround continuous flow conveyor with suspended flights

The handling of granular and pulverized materials often is complicated by their abrasive and corrosive qualities, and sometimes by dust explosion risk. For the milder materials the continuous-flow elevator-conveyor finds wide application. It handles the material as a continuing mass, is a slow speed machine economical as regards space occupied, is self-loading and requires no feeder, and though high in power requirement, that is usually of minor importance. For transfer in a horizontal runaround path the conveyor is nicely adapted as shown in Fig. 11. This is a Stephens-Adamson Redler Conveyor. The chain is carried clear of the trough and material.

The continuous flow machine of suitable construction may be used for materials somewhat abrasive or corrosive, but is not applied for such materials as sand and ashes. It is inherently dust tight, and when it is required to retain heat in the material, the duct is readily insulated.

A pneumatic conveyor sometimes solves a problem better than any mechanical conveyor, especially where the path is tortuous, or the material corrosive or abrasive. It must be free-flowing since sticky material packs at the elbows.

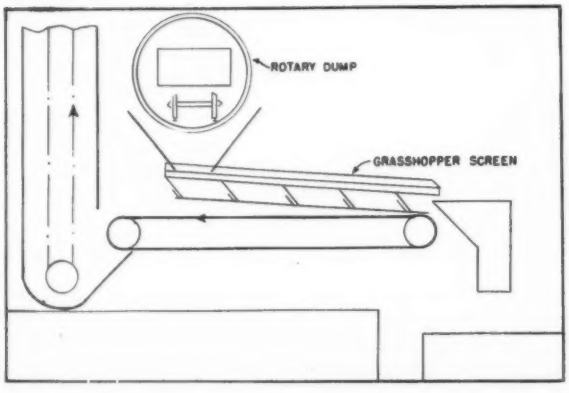


Fig. 10. Left: Headed for failure; capacity of dump and screen 200 t per hr; conveyors only 30 t per hr

Special Rack and Truck for Handling Cores

Contributed by
The Yale & Towne Mfg. Co.

THE CHEMUNG Foundry Co., Elmira, N. Y., solved the problem of transporting large batches of small, odd-shaped, green-cores, by the use of a six-foot, multi-shelf, angle-iron rack. The rack is used to haul quantities of cores from the coremaker to the bake ovens. Its construction shows considerable skill-in-design for the job that it is to do.

The shelf-ledges comprise 2 by 2 angles welded flange to flange so as to form channel-like members. The welded-angle construction is used instead of ready-made channels in order to facilitate machining operations which are done before assembling. Holes are drilled in the flange of one angle so that it can be bolted to the rack frame. Notches are cut in the flange of the second angle to secure pipes which make up the shelves.

This picture shows the construction of the rack specially designed for handling green cores at Chemung Foundry

The pipe construction permits the steel plates on which the cores are placed to be easily loaded onto the rack. The pipes can rotate slightly when the plates are loaded on or off, but they will not rotate during transit due to the downward weight of the loaded steel plates.

The shelves can be raised or lowered to accommodate various sized cores by bolting the channel-ledges to suitable bolt-holes located in the rack-frame.

Installation and Maintenance of COMPRESSED AIR RECEIVERS

By TYLER HICKS, *Hicks Associates*

COMPRESSED air is utilized in almost every manufacturing, industrial and power plant in operation today. The function of the compressed air system in the manufacturing or production process is generally important. For this reason the proper installation and maintenance of all components of the compressed air system is of vital importance in the proper functioning of the system.

The usual compressed air system consists of a compressor, an air receiver, and the air supply piping. During periods of operation the compressor raises the pressure of the air from that at the intake to that desired at discharge. By means of a suitable pipe the air is conducted from the compressor discharge to a storage tank or receiver. The receiver acts as a reservoir of high pressure air, equalizes pulsations in the air coming from the compressor, collects and traps moisture and grease which may be present in the air coming from the compressor, and cools the air before it enters the transmission system. Thus it can be seen that satisfactory performance of the compressed air system is dependent upon the receiver as well as the compressor. Therefore all air receivers must be properly constructed, well installed, and adequately maintained if a safe and dependable compressed air supply system is desired.

Air receivers are usually constructed of boiler plate as specified in the ASME Code for Unfired Pressure Vessels.* This code has not yet been fully accepted as the national guide for construction. Some states require adherence to a local construction code which is generally similar to the ASME Code, but not identical. Therefore, care should be taken to see that air receivers purchased for a particular plant meet existing state and local construction requirements. In the absence of local codes the receiver should be constructed according to the ASME Code.

In addition to specifying construction methods the various codes also prescribe the maximum allowable working pressure which may be used with a given type of construction. The maximum allowable pressure generally depends upon the thickness and tensile strength of the plate, dimensions of the receiver, efficiency of the joints, and the factor of safety employed. No air receiver should ever be operated at a pressure higher than the maximum allowable working pressure except when the safety valves are blowing.

Under these conditions the maximum allowable pressure should not be exceeded by more than 6 per cent. Maximum allowable working pressures and construction methods are fully covered in all codes. Installation requirements are usually broad in scope and permit many variations in method. For this reason there is a greater possibility of errors being made during air receiver installation than during construction.

The first step in air receiver installation is the selection of a location for the tank. In general, an air tank should be located near the floor and in such a position that it can be readily inspected from all sides. An air tank should never be buried underground or located in any inaccessible place. A cool location is preferable to a warm one because the cool atmosphere will help to condense the moisture and oil present in the air in the tank. Figure 1 is a composite photograph which shows the interior of a large compressor plant and a portion of the exterior of the same plant. As can be seen, the air receiver is mounted vertically outside the plant.

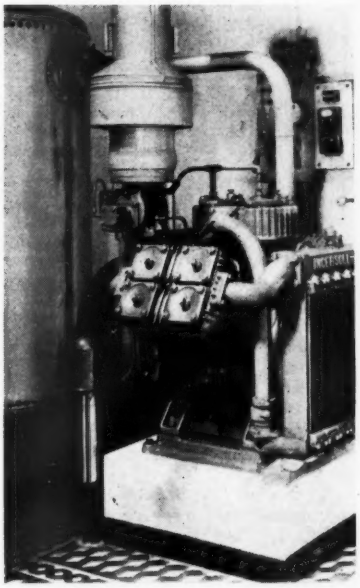


Fig. 2. A vertical receiver is shown here mounted close to a motor-driven compressor. The short length of pipe with only one bend is desirable to reduce pressure drops to a minimum

The type of mounting to be employed, whether vertical, horizontal, or suspended, depends upon the size of the receiver, space available, and the contemplated piping arrangement. Figure 2 shows a vertical receiver mounted close to a motor-driven compressor. The short length of pipe with only one bend is desirable to reduce pressure drops to a minimum.

Figure 3 shows several ways of mounting receivers vertically. In all cases a minimum clearance of 12 in. under the bottom head of the receiver is necessary to provide room for tank maintenance. Angle iron legs, concrete-supported I beams, and cast iron bases make excellent permanent supports when properly in-

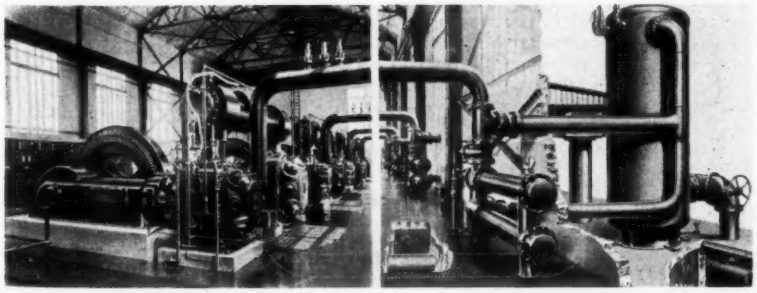


Fig. 1. The air receiver is shown in this photograph located outside the plant. A description of vertical mounting methods is given in the article

* ASME Code for Unfired Pressure Vessels may be obtained from the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. for $2.00.

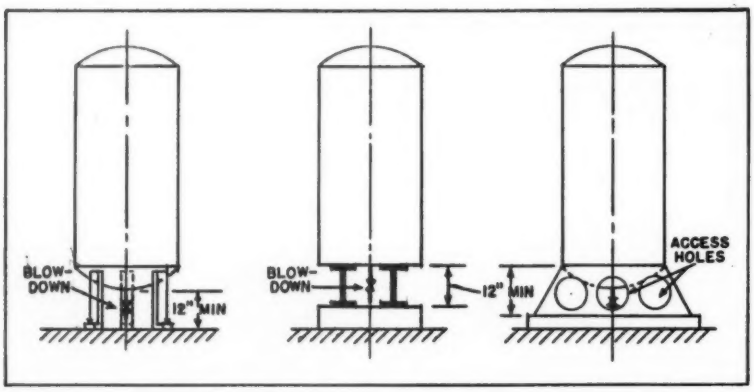


Fig. 3. Several ways of mounting receivers vertically are shown in this sketch. Angle iron legs, concrete-supported I-beams and cast-iron bases make excellent permanent supports when properly installed

stalled. Each type is shown in Fig. 3. Next in popularity after vertical supports are horizontal supports.

Three accepted types of horizontal air tank supports are shown in Fig. 4. A minimum clearance of 12 in. should also be provided for tanks supported in this manner. When air tanks are mounted horizontally outdoors the supports should be strong enough to resist overturning and failure during periods of high velocity winds.

A typical means of suspending compressed air receivers is shown in Fig. 5. This method of supporting air receivers is generally limited because structurally it is easier and more economical to support tanks on a floor of some kind. However, where space is limited, or where a large number of small tanks must be used, the suspended tank forms a neat and workable arrangement. Regardless of type of mounting whether vertical, horizontal or suspended the air tank must be firmly anchored and prevented from vibrating.

Tank vibration and swaying result from excessive pressure pulsations and movement of the piping connected to the tank. Pressure variations will be large when the demand for air fluctuates rapidly and widely. Under these conditions a tank which is too small for the load may vibrate and sway excessively. Tightening the tank supports, if this is possible, will not solve the problem. A better solution, and probably the best, is to install a larger tank of suitable capacity, or a second small tank.

When air tank vibration and swaying are caused by the piping connected to the tank other means of solution are necessary. Compressor movement may be transmitted through the piping system to the tank. In such cases the compressor must be more firmly mounted and the movement absorbed by some method of damping. Piping with many sharp bends and elbows may also cause air tank vibration.

Large stresses can be set up in short radius pipe bends by a rapidly moving stream of air. The best remedy for this situation is the installation of long radius bends in the piping between the compressor and air receiver. These types of bends will eliminate vibration from most compressed air piping systems.

Once an air receiver is installed it must be prepared for operation. A drain pipe and valve should be tapped into the lowest point of the receiver. This pipe and valve will permit easy removal of all accumulated oil and water. Traps are sometimes used in place of the valve and pipe drain. Irrespective of drain type, the connection must always be made to the lowest point in the receiver.

Besides a drain, a safety valve and a pressure gage must also be installed. The type and size of each should be that recommended by the tank builder. Safety valve sizes are generally proportional to the capacity of the compressor and should never permit the tank pressure to exceed the maximum allowable pressure by more than six percent. Safety valves on outdoor tanks should be protected from the weather by a permanent hood.

The discharge from the safety valve should direct the air away from the possible position of any plant personnel, machines or manufactured products. If this is not possible a satisfactory shield around the valve can be used to prevent injury to personnel or products. There is only one other major consideration in air receiver installation, and that is the air piping which is connected to the receiver.

When possible the pipe between the compressor and receiver should be installed without any intervening stop valves. However, stop valves are generally needed when more than one compressor is connected to the same receiver. Stop valves, if used, should be of the gate or straight way type. In all cases where a stop valve is installed in the supply piping to a receiver, a spring pop safety valve must be provided between the compressor and stop valve. This safety valve should be set to blow at a pressure a little higher than the blowing pressure of the safety valve on the air tank. Installation of this safety valve will prevent blowing a cylinder head off when starting the compressor.

Discharge piping from the receiver does not require any special valves or fittings. The discharge line had best be connected to a moisture-free point in the tank and adequately dripped where it rises vertically several stories. A drip at the end of the line is also necessary. Once the air receiver has been installed, fitted with necessary drains and safety devices, and satisfactorily piped, operation of the system can be started.

As soon as any machine or device starts to operate, the question of maintenance arises. Since the function of any system of maintenance is to keep the unit in good operating condition for as long as possible, the development of such a system deserves much study. Briefly, air receiver maintenance falls into four categories. These are: (1) inspection; (2) testing; (3) routine blowing down; and, (4) painting.

Air receivers should be thoroughly inspected by a competent plant mechanic at least once a month. At this inspection the general external appearance of the receiver, piping and fittings must be carefully noted. Corrosion on the outside of the tank, any leaks in the tank or piping, or faulty drains and gages should receive immediate attention. Once a year an internal inspection is usually

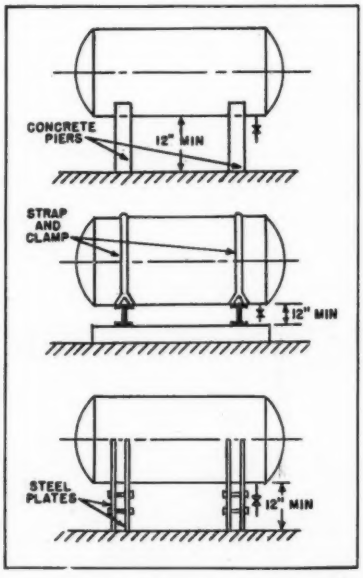


Fig. 4. Accepted types of horizontal tanks supports are shown in this drawing. Note that a minimum clearance of 12 in. is left at bottom of tanks

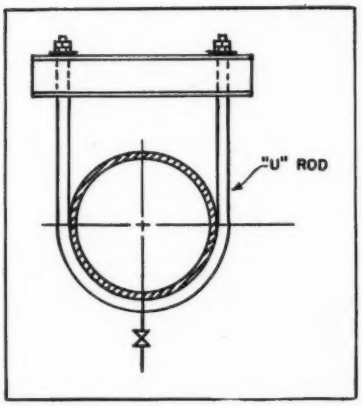


Fig. 5. A method of suspending air receivers. This method is generally limited in use because it is more economical, generally, to install them by other means

necessary. This requires that the tank be isolated from others by closure of proper valves. If the tank is large enough to permit entry the inspection can best be performed from the interior. Small tanks can be inspected by use of a portable light and an experienced pair of eyes and hands. At the annual inspection all corrosion should be carefully noted and recorded. If the corrosion is extensive the advice of a state or insurance company inspector had best be sought. Next in importance to inspection is testing.

Receiver safety valves may be tested during the monthly external inspection. This can be done by permitting the pressure to rise above the maximum working pressure of the tank and noting the value attained before the safety valve pops. If the rise is more than 6 per cent of the maximum working pressure the valve should be adjusted to give the correct rise. Where tanks are located in spaces with semi-skilled laborers who are operating machines dependent upon compressed air, a lock is necessary on the valve to prevent tampering with the setting. If a safety valve is fitted to the compressor or in the discharge line from it, this valve should also be tested. After testing, the next maintenance job is blowing down.

Frequency of air receiver blowing down will depend upon the condition of the compressor intake air, type of lubricant used in the compressor, and load on the air system. Some receivers require blowing down once a week, others once a month. Each receiver must be studied to determine the time interval which may safely elapse before blow down is necessary. During freezing weather outdoor receivers have to be watched carefully to prevent a large accumulation of oil and water which might freeze and damage the tank. Accumulated oil and water reduce the available tank volume and as a result sometimes cause tank vibration. The importance of frequent blow down can therefore be readily appreciated. The final step in maintenance is painting.

An attractive receiver layout, Fig. 6, can be achieved by good painting. Neglect of painting will detract from plant appearance. Frequency of painting will depend upon receiver location, atmospheric conditions, and the amount of traffic past the tank. A coat of paint once every 3 yr is a nominal figure, but some receivers may require paint more frequently. A neat paint job makes for better plant housekeeping and a more attractive installation. The cost of paint is small when compared with the advantages of pleasing appearance, the cleanliness induced in plant personnel, and the greater care which maintenance men will provide for clean equipment.

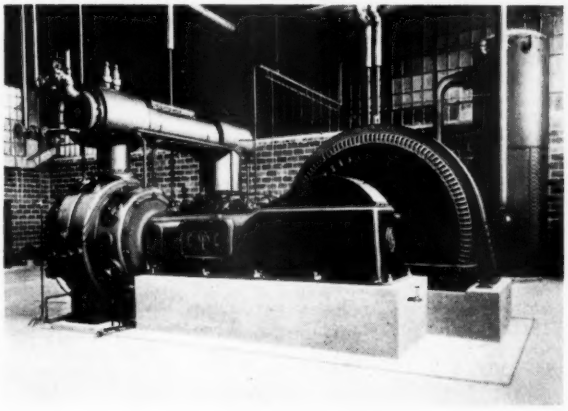


Fig. 6. Proper painting can make an attractive receiver layout. Cleanliness induces more care by maintenance personnel

Plant Model Feature of Open House

Contributed by American Central Div.

As a part of its continuing industrail relations job, American Central Div., Avco Manufacturing Corp., Connersville, Ind., recently held an open house. Everyone in the surrounding area was invited and despite poor weather nearly 4000 attended. This is almost 35 per cent of the area's population.

A novel use for a plant model was demonstrated at the open house. Deciding that a far more impressive view of the plant was afforded to birds and plane passengers than to the townspeople, American Central set up the plant model as shown in the photograph. The reaction proved the company was right.

One of the many unusual features at the American Central's open house was the public display of the plant's model layout. The model was displayed before a crowd of nearly 4,000

Purification of Industrial Air

By ROBERT H. EMERICK,
Consulting Mechanical Engineer, North Charleston, S. C.

PLANT CONDITIONS adversely affecting personnel, materials or both, and apparently of mysterious origin, actually may be the direct result of minute agents in the surrounding atmosphere. Invisible and odorless, for instance, carbon monoxide consistently present in concentrations as low as 2 parts in 10,000, can create headache, accidents, and a slowing of reflexes.

Carbon monoxide is not restricted to tightly closed spaces. It can augment the afternoon fatigue of a traffic policeman at a busy intersection and has brought death to a worker who stretched himself out to rest 18 ft from a hot slag pile. In these low concentrations of 2 to 8 parts per 10,000 we find the chronic poisoning that makes us wonder just why we are logy, dull, and making inexplicable mistakes.

Among other unfriendly elements, will probably be found dust particles, too tiny to show as motes in a sunbeam but sufficient to affect fine finishing work. Again, one man, coordinating his work with a group, can decrease the efficiency of the entire group, if he alone is affected unpleasantly, or is nauseated by an odor.

Table I. Particle sizes of various dusts, gases and vapors

Material	Diam. in Microns
Coal Dust	10.0
Powdered coal Ash	1 to 150.0
Tobacco Smoke	0.25 to 1.0
Soft Coal Smoke	0.30
Cement Smoke	5.0 to 100.0
Talc Dust	10.0
Silica Dust	5.0
Sprayed Zinc Dust	15.0
Flour Mill Dust	15.0
Alkalis	1.0 to 5.0
Ammonium Chloride Fumes	0.1 to 1.0
Zinc Oxide Fumes	0.05
Various Pigments	0.2 to 5.0
Ragweed Pollen	20.0

Note: The division line between visible and non-visible particles is generally considered to be 50 microns. Smaller particles must be viewed through a microscope. A micron is the equivalent of 1/25,000 of an inch.

To correct these problems we can apply industrial air conditioning, or purifying. Not always is our own plant the source of the trouble. In fact, identifying and locating the origin of air troubles often is a major problem. For dusts, we can set up collecting jars on our own and adjacent roofs, and by analyzing the captures, trace them to their points of origin.

The seriousness of these minute agents is illustrated by the case of a manufacturer of face powder, who discovered that his product was scratching the skin of his customer. Months passed, he investigated thoroughly every phase of his manufacturing processes, and actually commenced to see signs of his business folding up, before he identified a wisp of fly ash from a boiler plant a half mile away. The boiler plant installed electrostatic precipitators on the flue gas, and face powder customers began smiling again.

Suppose we see what weapons we have available for defeating these subversive elements in our atmosphere.

First, consider the filters. The finest mesh screen we have today is incapable of separating particles smaller than 40 microns in diameter, approximately. As a micron is approximately 1/25,000 in., and the particles forming smoke and fumes are so tiny as to represent a mere fraction of a single micron, we are going to need some finer method of collecting for many of our air-borne sabateurs. Particularly is this true of odors, for the material particles which form an odor are infinitesimal beyond measurement, and nothing coarser than a hound dog's nose seems able to pick them out individually.

Consequently, a mesh filter alone won't do, so we have recourse to filters coated with adhesive materials which trap the particles as fly paper traps flies, or we can use dry mat type of filters in which the filtering mat is made from fine threads of strong materials such as spun glass, all woven into a baffling maze of air passes and dead ends.

Odors and fumes going through filters may be caught in the filter, or passed, depending both on the nature of the gas and the type of the filter. Filters loaded with activated carbon will absorb animal odors, tobacco smoke, grease and cooking odors, but they will not absorb carbon monoxide or ammonia. To be absorbed by a filter, the odor or fume must have an affinity for the materials of the filtering medium, thus food odors readily unite with water, generally for worse, as we all know by the sometimes disagreeable flavor of our ice-cubes.

Figure 1 illustrates an effective arrangement of air washer, glass capillary filter, and cooler, suitable for many industrial air conditioning problems. The cooler need not be installed of course, if we like to take our temperature as it comes; however in some areas of the country, cold water is available all summer, and here the lucky plants will enjoy comfort cooling as a bonus with equipment of this kind.

Water sprays will wash out much of the dust, and also absorb many gases; however the effectiveness of water washing in any particular problem should be referred to the maker of the apparatus for evaluation. In fact this is a prudent approach to any air purifying consideration, for what the manufacturer will guarantee is exactly what we can expect, and no more. The difference in guarantees can be a valuable guide in helping us choose the

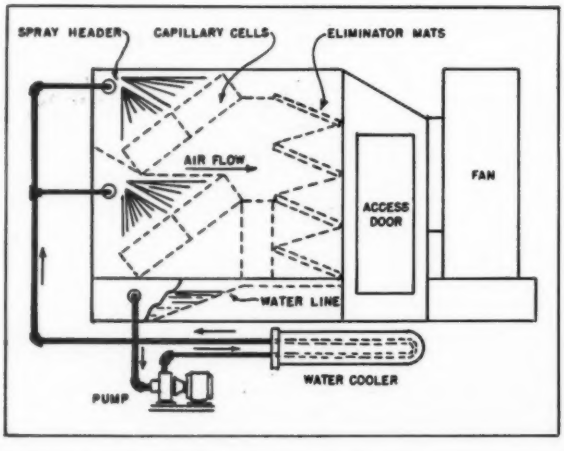


Fig. 1. Diagrammatic representation of an air washer with a supplementary cooler. When cool water is available the year around it is not necessary to include the cooler

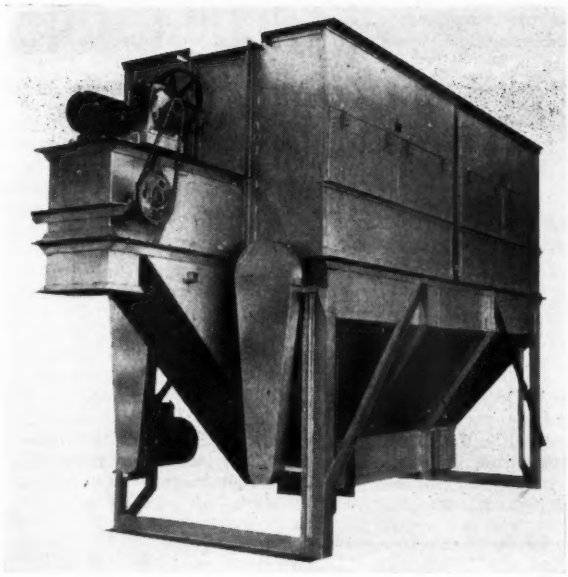


Fig. 2. In this type of dust collector water is used as the medium in which the sludge is formed. The dust is trapped in a whirling mass of water and finally is concentrated in the form of sludge at the bottom of the collector

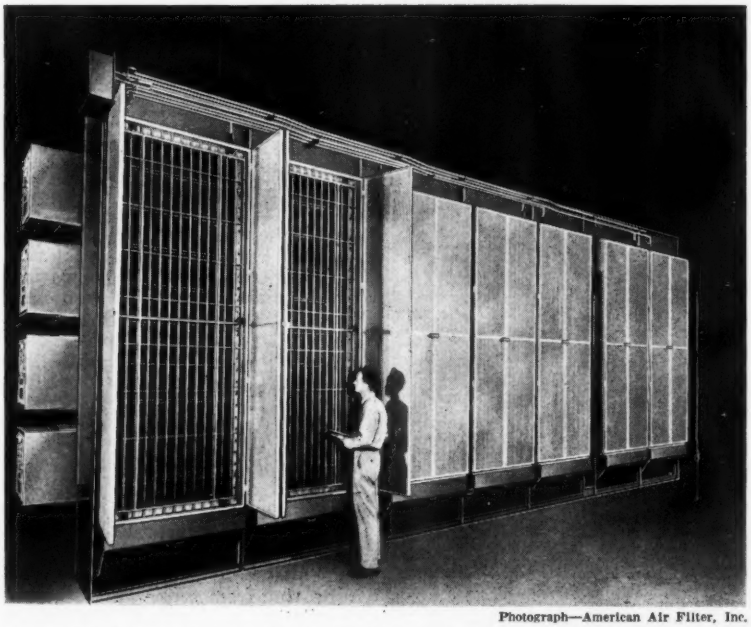
Photograph—Peters-Dalton, Inc.

most suitable apparatus for the conditions in our own particular plant.

The use of water to form a sludge in dust removal is employed by the collector shown in Fig. 2. Here the dust is trapped in a whirling mass of water, is finally concentrated as a sludge in the bottom of the machine, and is removed either by a conveyor, or by hand, as desired. These sludge units are built in various sizes and in various shapes, to handle any volume of air and any weight or fineness of dust.

One thing we must remember in the use of any water scrubber: the cleaned air will be saturated with water, approximately 100 per cent relative humidity, and if we don't like it that wet, or can't use it that wet, then we must either dehumidify it, or choose some other type of purifying process.

Electrostatic precipitators, as illustrated by Fig. 3, are available from several manufacturers. They have a wide field of action, being effective not only on dust particles, but on acid mists, metallurgical fumes, sodium salts, carbon black and smoke. However, electrostatic precipitators will not kill odors, and we must look elsewhere for the cure for a bad smell.

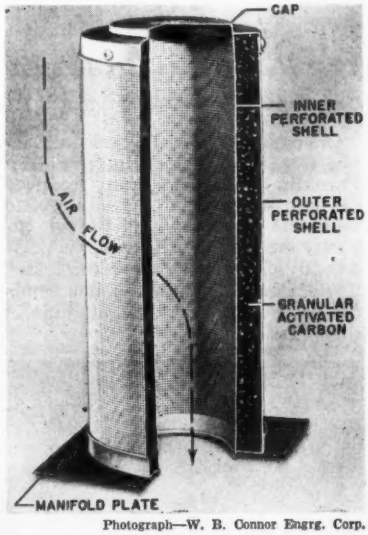


Photograph—American Air Filter, Inc.

Fig. 3. This electrostatic precipitator is capable of purifying air at the rate of 120,000 cfm

Activated carbon is perhaps our most catholic absorber of odors. If we have any doubts as to the material existence of an odor, the use of a canister of activated carbon will soon prove to us that the particles in any odor are real and earnest. The canister increases with weight as time passes, and this increase is made up of small particles of the substance giving off the odor, accumulated in the carbon. In fact, we know that when a canister of activated carbon has increased from 15-20 per cent in weight, the time has come to reactivate it; it is now loaded and can carry no more.

Figure 4 shows a typical canister. The air enters the canister through the metal sides, which are perforated with many holes sized for this purpose, then it filters through the carbon bed and ultimately escapes into the clear bore of the canister. De-



Photograph—W. B. Connor Engrg. Corp.

Fig. 4. Activated carbon is capable of removing many odors from the air. Shown in the photo is the cross-sectional construction of a canister containing activated carbon

pending on the amount of odor or vapor to be absorbed, each canister will handle approximately 20-35 cu ft of entering air per minute, and a battery can be installed to handle any volume. Physically, canisters are about 12 in. tall, 4 in. outside diameter, and contain up to 1 lb of activated carbon each.

Activated carbon cannot be used for either carbon monoxide or ammonia vapors. In fact, if carbon monoxide is causing the unhappy conditions in the plant, there seems to be no cure except by dilution of the atmosphere with plenty of fresh air. No chemical absorber or neutralizer appears to be available commercially at this moment.

In summary, the real need for industrial air conditioning does not become obvious until a test has been

Table II. Various types of purifiers and the services for which they are recommended

Purifier	Removes Dust	Removes Odors	Removes Fumes	Removes Smoke	Removes Fly Ash
Dry Mat Filter	Yes	No	No	No	No
Adhesive Surface Filter	Yes	No	Some	Some	No
Water Washers	Yes	Some	Some	No	Yes
Electrostatic Precipitators	Yes	No	Some	Some	Yes
Cyclones	Yes	No	No	No	Some
Sludge Units	Yes	No	No	No	No
Activated Carbon	No	Yes	Yes	Yes	No

Note: In setting down the above characteristics, consideration has been given to conventional practice, and the "Yes" or "No" qualification does not always mean categorically what it says. For example, the dry mat and adhesive surface filters certainly could remove a percentage of fly ash if this material were delivered to them for separation; however their physical characteristics are such that they are not suitable for fly ash service. Where the word "Some" is used, it means the filter will remove some substance but not others.

made of the plant atmosphere. If you feel, or are certain, that everything is not just right, your first duty is to make a series of air checks. These checks should run over a period of some days, and consider the possibility of changing conditions throughout any given day, The face powder manufacturer, for example, discovered that fly ash reached his factory only at infrequent intervals, depending on the occasional unholy alliance of boiler plant load and wind direction. Carbon monoxide may come through windows only when the neighboring truck garage happens to open a certain back door. Our stomach may take to the trapeze each Tuesday at 3, when the gas works is running a charge of tar through the creosote stills. Fine paint finishes may turn a trifle rough every other week only, when the wind happens to find them downstream from the cement mill.

Once you have identified the airborne agent, then you can locate its source and devise means either to eliminate it, or to make it harmless. Fortunately, making air tests is neither difficult nor expensive, and more often than otherwise, installing corrective apparatus is not unreasonably costly either. As cases differ, we must each evaluate our individual situations for ourselves.

Portable Oil Cleaner Cuts Oil Consumption

Contributed by Walter Rudolph

OIL CONSUMPTION at Franklin Plastics Div., Robinson Industries, Inc., Franklin, Pa., has been reduced through a systematic cleaning and reclaiming program. A 75-gal capacity machine, for instance, is periodically checked for cleanliness and, if necessary, a maintenance man brings a mobile reclaiming unit to the press.

Hose sections are inserted in drain and fill opening and the refiner pumps the oil from the press, cleans it and returns it for re-use. Some time ago the plant engineering department noticed that a large quantity of press oil was wasted through drippings from pistons and elsewhere around the press. This "waste" oil was wiped off or just cleaned up and was regarded as an operational overhead. Now each press has its individual drain which carries the oil under the floor to a centrally located "oil well." There it gathers in a tank from where it is regularly pumped into the mobile refiner and thus reclaimed for future use.

Water savings have been made by the installation of water meters on each press. This enables the company to make more accurate compilation of cost production figures.

A mobile oil reclaimer is moved about the Franklin Plastics plant for periodic cleaning of press oil as shown in this photo. This reclaimer also cleans oil drippings that are drained under the floor from every machine and are piped to a central well

What Plant First Used Air Conditioning?

WHICH WAS THE first factory in the United States to install air conditioning?

This question is being asked by the Refrigeration Equipment Manufacturers Association in an effort to discover and recognize the first concerns in this country to have adopted air conditioning.

The air conditioning and refrigeration industry is said to be the fastest growing industry in the world and the Association is compiling a history of its development and desires to recognize those forward-looking companies who were pioneers in their particular industry.

Factories which installed air conditioning early and who believe they may have been among the first to do so, should contact the Editor, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago.

The Association will want the date and extent of the installation and a brief description of the type of equipment as well as the present air conditioning program if it has been augmented. It is also interested in hearing from those who feel their installation may now be the largest in their industry.

EFFICIENT
Motor Bearing Lubrication

Efficient bearing lubrication is dependent as much on the lubricating system as it is on the lubricant. This informative article describes the operation of the ring, chain, and collar-oiler methods for lubricating sleeve bearings, and points out a number of the maintenance problems involved. Operation and maintenance of ball, roller, and sealed ball bearings is also discussed here

By CARL THOMAS

THE LUBRICATION of a motor bearing would, at first thought, seem to be quite a simple detail, but actually such is not the case. Considerable care is usually taken in the selection of lubricants; but, often, too little attention is given to the design, selection, installation, and maintenance of the lubricating appliances and systems. Proper lubrication is dependent as much on the lubricating system as it is on the lubricant.

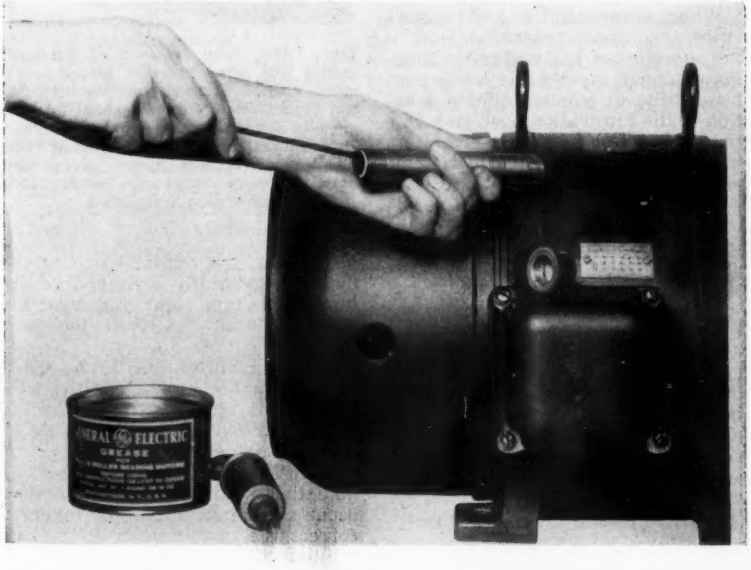
Several methods are employed for lubricating sleeve bearings, the principal ones being ring, chain, collar and wool-packed. The ring oiler, invented in 1868 by John Sweet, is used very extensively on medium size, moderate speed motor bearings. In this type of lubrication, one or more metallic rings rest on the shaft inside the bearing housing and rotate with the shaft. Since the lower part of the ring is submerged in the lubricant contained in the bearing reservoir, as it rotates it carries a film of oil to the top of the bearing. This oil then flows through the bearing by gravity, thus lubricating it, and returns to the reservoir.

The chain oiler performs the same function as the ring oiler. It is generally used on slower speed motors because of its ability to supply a greater quantity of oil than the ring oiler at the slower speed.

Where exceptionally high speeds would cause the shaft to slip under a ring oiler, a collar is machined integral with, or fastened to, the shaft. Sometimes oil wipers are provided at the top of the bearing to scrape the oil from the collar and allow it to feed to the bearings. This overcomes the tendency of centrifugal force to throw the oil off the collar.

In the wool-packed bearing, lubricant is fed to the rotating shaft through the wool packing, which serves as a wick or sponge to hold the oil supply.

Bearings of the ring, chain or collar-oiled type should be checked once a week under normal operating conditions. If the lubricant level is lower than the mark on the oil gage, add enough oil to raise it to the correct level, but be sure not to fill higher as it may overflow when the oil warms up and expands. If no lubricant level mark is provided, fill to within ⅛ in. from the top. Where sight glass gages are provided, the correct lubricant level is shown, unless the lubrication instructions for the motor give a different level.



Cleaning pressure relief pipe on totally-enclosed motor preparatory to greasing the bearing. Old hardened grease is removed with a screwdriver, wire or similar implement

Maintenance of Sleeve Bearing

Ring, chain or collar-oiled bearings should be drained, thoroughly flushed out with light oil and refilled at least once a year. Where unfavorable conditions prevail, such as abrasive dust in the air, this should be done oftener, depending upon the severity of the conditions. The amount of grit found in the lubricant upon periodic flushing should serve as a guide to the necessary frequency of flushing.

If the bearing housings are equipped with drain plugs, these should be removed when flushing the bearing. On motors that do not have drain plugs, the end-shield bolts should be removed, the end-shield rotated, and the bearing carefully cleaned before the end-shield is replaced and the bolts tightened. After this the new oil may then be added.

Wool-packed sleeve bearings should be given somewhat different treatment. In normal service such bearings should be reoiled every three months, but if the motor operates 24 hr a day or under other severe conditions, the reoiling periods should be shortened to once a month.

Such bearings are usually provided with some form of oil level indicator.

This may be an oil level gage on the side of the bearing housing or a small overflow hole on the end of the housing. Where the gage is provided, carry the oil level at the same height as for a ring-oiled bearing. When refilling a bearing having an overflow hole, fill only until the oil begins to run out of this hole. It is well to add only a small quantity of lu-

bricant to a bearing of this type and then wait a little while to see if the oil reaches the overflow hole before adding more lubricant, because of the time necessary for the oil to soak through the packing.

Once a year wool-packed bearings should be cleaned. Remove the packing carefully, rinse it in a container of light oil to remove grit and dirt, flush out the bearing housing with light oil, carefully replace the packing, and add new lubricant to the correct level.

Ball and Roller Bearing

Ball and roller bearings operate on a different principle from that of sleeve type bearings. These bearings carry the shaft load by direct contact on balls or rollers as opposed to sleeve bearings which carry the load on an oil film when in operation.

Ball and roller bearings could be operated dry if their temperature could otherwise be controlled. Lubrication is employed to minimize the friction and generation of heat caused by the balls or rollers rubbing on the outer race as they roll over the top or by their rubbing on the cage or retainer. Another contributing cause of heat is the alternate compression and release of the balls or rollers as they enter and leave the load area.

Ball and roller bearings need be checked only once every six months unless in very severe service, when they should be examined at three month intervals. If the grease appears to be in good condition, soft and of normal color, the bearing can be run until the next checkup period without regreasing. However, if the grease is hardened or has changed color, the bearing should be flushed clean of old lubricant with a safety solvent such as carbon-tetrachloride, flushed again with light oil, and then filled one-third to one-half full of the proper grade of new grease. Never fill such a bearing more than half full as the excess grease will interfere with the operation of the bearing parts, cause heating, and possibly result in undue wear.

Some bearings are fitted with grease relief fittings. These simplify cleaning of the bearing by providing a drain, and safeguard the bearing against over-greasing. Where such fittings are not provided, it may be necessary to remove the bearing end cap, or even the bearing end-shield, in order to properly clean out the bearing housing.

It is extremely important that ball and roller bearings be kept free of dirt and grit because of the small clearance in the bearing. For this reason special precautions should be taken when cleaning, opening or regreasing such bearings to see that all dirt and grit is completely removed from the bearing housing; that all greasing equipment, lubricant containers and tools are kept clean; and that the open bearing is protected against dirt and grit with a clean piece of cloth.

Some ball and roller bearings are oil lubricated. Bearings of this type require the same lubrication procedure as ring-oiled sleeve bearings.

The choice of a proper lubricant for ball and roller bearings will likewise be influenced by operating conditions and surroundings. For average conditions a good grade of medium ball bearing grease should be used. But where low temperatures prevail it might be necessary to use a lighter grade of lubricant; and where the motor operates at an excessively hot temperature, the use of a high temperature fibre type grease might be necessary.

In recent years motors have been put on the market equipped with sealed ball bearings that need not be lubricated for periods of from two to five years. Such bearings have a supply of grease that is better protected from oxidation and contamination from dirt, thus insuring a longer lasting lubricant supply. At the stipulated periods these motors must be taken apart for bearing service. Usually the armature or rotor is removed and then the sealing rings are pried from the bearings. Cleaning fluid is poured into the bearing to dissolve the old grease and is then blown out with compressed air, thus leaving the bearing clean. A few drops of clean lubricating oil are then added to the bearing and the correct amount of ball bearing grease, as recommended by the manufacturer, is added also. After the bearing sealing rings have been replaced, the motor is assembled and is ready to run for another two to five year period, as far as lubrication is concerned.

The Silicone Greases

Where severe heat or low temperature conditions are encountered in the operation of ball and roller bearing equipped motors, the lately perfected silicone greases offer a solution to the lubrication problems. One type of silicone grease gives ten times the service life of high temperature petroleum grease at elevated temperatures and will lubricate satisfactorily at 40 deg below zero F. Another type of silicone grease will give about five times the service life of high temperature petroleum grease at elevated temperatures, but will continue to lubricate adequately at 65 deg below zero F.

It is especially important to keep motors equipped with ball and roller bearings free of grit and dust, especially around the bearing housings, since these bearings do not have the advantage of automatic oil flushing as do ring-oiled motors, or oil filtering as do wool-packed bearings.

On geared motors, usually the bearing on the gear end of the motor are lubricated by the same lubricant that lubricates the gears. But the bearing on the opposite end of the motor is generally a conventionally lubricated type and requires the same care as described for such bearings.

An examination should be made of each motor bearing periodically while it is operating to determine whether it is functioning properly or whether it is excessively hot or noisy. This will serve to discover potential breakdowns before they occur so that steps may be taken to correct the condition or to replace the defective bearing.

Top: Fitting hole is freed of hardened grease with screwdriver or similar instrument. Center: Flushing bearing with carbon tetrachloride, then with light lubricating oil. Bottom: Adding grease while motor is running until grease shows at relief fitting hole. Motor is allowed to run until no more grease comes from bearing, then relief plug is replaced

All photographs were supplied by the General Electric Co.

Before Painting Metal— Condition It With a Flame

Besides removing rust, scale and other foreign deposits, the chief advantage of using the oxy-acetylene flame for conditioning metal surfaces is to remove moisture . . . Paint also can be applied smoother and faster and will penetrate fissures and crevices . . . Types of equipment, methods of use, removal of rubber linings, removal of tar-base paint Mr. Cuke gave this talk before the International Acetylene Assn.

By N. H. CUKE, *Metallurgical Engineer, Canadian Liquid Air Co.*

THE OXY-ACETYLENE flame conditioning process has made tremendous strides in the last year or so. It is rapidly becoming one of the most popular and useful processes since the advent of the oxy-acetylene welding torch. The process is by no means a recent or new development but what is new, is the great interest it has aroused recently and the many new causes which have been found for it and the ever-widening variety of structures on which it has proven its worth.

While the process has been used quite extensively for the removal of scale from billets, forgings, and castings, its main use is for preparing steel surfaces prior to painting.

It is a long established fact that trapped moisture is the major cause of paint deterioration and steel corrosion. Mechanical surface preparation such as sand blasting, scraping, or wire brushing, will remove most of the rust, scale and other foreign matter on an unpainted steel surface, with a result that the surface appears to be quite clean. However, these mechanical methods do not remove the moisture; in fact in the sand blasting method there is even a tendency to add moisture if the compressed air is not dry. With the flame conditioning methods, moisture on the surface underneath the scale, and physically absorbed and chemically combined water in any rust that is present, turns to steam and is driven off. As mentioned previously, due to the high temperature and velocity of the oxy-acetylene flames, scale is loosened or popped off. Also, the fact that moisture underneath the scale turns to steam helps in loosening the scale.

After flame conditioning followed by immediate brushing, the surface is dry, clean and warm, an ideal condition for the application of paint. Figure 1 is a close-up of a badly corroded steel surface and Fig. 2 shows the same area after flame conditioning. All the products of corrosion have been completely removed leaving the steel bare and clean. To obtain the full benefit of the process the primer coat of paint must be applied while the steel is still warm, that is, before moisture in the air recondenses on the surface. The temperature to which the surface of the base steel is raised should be above 212 F, but need never exceed 300 F. Before applying the primer it should be allowed to cool to a point definitely below the boiling point of water, preferably to approximately 125 F, that is to a point where it feels very warm to the hand but not so hot that the hand cannot be held on the steel. If the steel is too hot when the paint is applied the oils in the paint are liable to separate out.

Besides increasing the life of the paint, the paint can be applied smoother and faster and will penetrate readily into any minute crevices or fissures in the steel or tightly bonded scale; also the paint dries faster reducing the setting time. A further advantage is that painting can be carried out in cold or damp weather or in locations where the humidity is always very high. Oil and other foreign matter are burnt or consumed. Any scale that is not loosened as a result of the flames need not be removed for as long as it is dehydrated it should never come away from the surface. It cannot be stressed too strongly the importance of dehydration of a steel surface to be painted.

Besides preparing bare steel surfaces for painting, the process is equally adaptable and beneficial to the preparation of old painted surfaces. Poorly bonded paint can be lifted and partially burnt with the high temperature oxy-acetylene flames. On surfaces where only one or two finish coats of poorly bonded paint exist, a quick single pass of the high temperature oxy-acetylene flame is often enough to lift and cockle the paint as well as loosen the scale and rust and dehydrate the surface. The surface is then easily cleaned by wire brushing. Figures 3, 4 and 5 show how well the flame conditioning process accomplishes its aims.

Where many coats of paint are encountered several passes of the flames with intermittent light wire brushing or scraping may be required. If deterioration and corrosion have progressed to an unusual degree resulting in a measurable thickness of iron oxide it is often found best to flake off this accumulation with scrapers prior to flame conditioning. It is generally recommended that power wire brushers be used wherever possible for the final brushing action to ensure that all the loosened material is completely removed.

In preparing an old painted structure for repainting it is usually advisable to remove all of the finish coats of paint. However, it is generally agreed that when a primer coat or base coat such as red lead is encountered, the primer coat need not be removed in places where it does not show signs of lifting after

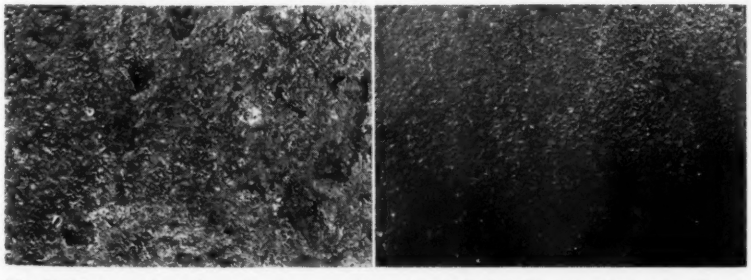
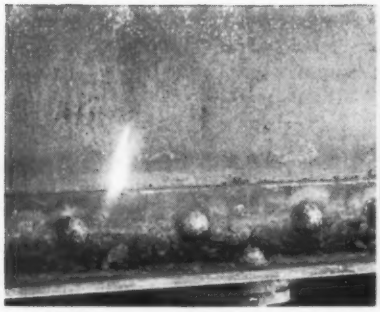
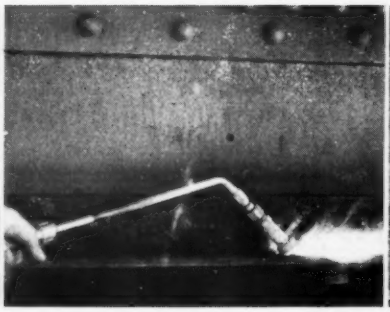


Fig. 1. Photograph at the right shows surface of steel before flame conditioning. Fig. 2. This picture shows the steel after it has been cleaned by the oxy-acetylene flame





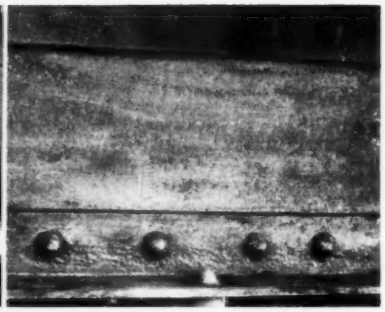


Fig. 3. Photo at left shows section of steel beam before conditioning. Fig. 4. This photo shows how one torch nozzle for flame conditioning use appears. Fig. 5. The last picture shows the cleaned metal surface just prior to repainting

a single pass of the flames. It is believed that if the primer coat is unaffected by the flames it is so well bonded to the steel that its removal is unwarranted.

The equipment for the flame conditioning process is extremely simple —it is easy to operate, flexible and light in weight. Usually two types of tips or burners are used. The first is a flat tip with a single row of multiple oxy-acetylene flame orifices. The standard flat tips range in size from 2 in. to 12 in. wide and are used for flat unobstructed areas or for rounded surfaces such as pipe, in which case they may be bent to conform to the contour of the pipe, as in Fig. 6. It is naturally more economical to use the widest tip possible although the 6 in. size seems to be the most popular. The other type of tip is a round tip with a large number of flame orifices arranged in concentric circles. There are usually about three standard sizes for this style of tip. The round tip is used for confined or obstructed areas such as around rivets, fittings, in corners, etc. Hard-faced wearing skids are mounted on both styles of tips so that they may be moved along the rough surface being conditioned, in contact with it, without the tip itself becoming worn or damaged. Both styles of tips are used with standard welding torches and can be connected directly to the torch or used with extensions. The equipment is entirely portable and as readily adapted to field work as to shop work.

When recommending or providing equipment for a certain job careful consideration should be given to the supply of the gases—oxygen and acetylene. The flat style of tips requires gas flows varying between 60 and 250 cu ft per hour depending on the size of tip being used. As mentioned previously it is more economical to use the widest tip possible. This is from the labor cost point of view. However, on studying a particular job closely, it might be found that this saving in labor is offset by the expense of purchasing the necessary equipment to supply the heavy flow of gases required for the large tips. Particularly is this true with the acetylene. When cylinder acetylene is being used manifolds should be provided, the minimum number of cylinders being manifolded together depends on the size of the tips being used. As a flow of only 50 cu ft per hour should be drawn from any one cylinder the minimum size of the manifold depends on the flow required. Another thought to be considered is that the larger the manifold the lower are the cylinder handling costs through time wasted and labor used in changing cylinders. For a shop job it is more economical to operate the torches off the shop pipeline if the shop is piped. Again, the tips must be selected after the flow has been considered to ascertain whether the supply will be adequate. It is not wise to overload the source of supply which may be carbide generators or manifolded cylinders. The flow demand of the other pipeline outlets in the shop also must not be forgotten.

For small or medium sized jobs in the field portable manifolds (available up to five cylinders) are generally used, and for extensive jobs large stationary manifolds (available up to 12 cylinders) are recommended. However, for all jobs a fair saving may be realized by the use of portable generators.

The operation of the flame conditioning equipment and process is extremely simple and requires little physical effort. Trained welders are not required as anyone can pick up the technique with a few minutes practice. The tip is rested on the steel surface on its hard-faced skids and the torch held so that the flame impingement angle is approximately 45 degrees to the surface. The torch is usually moved forward at a uniform rate or with a progressive reciprocating movement. The operator quickly adjusts his forward speed to provide for the greatest effectiveness. If he moves too slowly the base metal will overheat and if on a painted surface the tips will "gum up" with softened paint. If he moves too fast only the very light scale will lift or the paint will not cockle and will be difficult to wire brush. This speed depends on the amount of scale present or the extent to which corrosion has advanced or the number of paint coats to be removed. Often it is found necessary to use more than one pass—again on certain jobs it is found more advantageous to change the technique somewhat. In some cases it is found more economical to remove a heavy layer of paint (eight to ten coats) by dragging the tip backwards instead of pushing it forward. The tip may be moved quite slowly, slowly enough that only one pass is necessary. By pulling the tip backwards over the surface there is no difficulty with the softened paint gumming up the tip.

On thin plates or corrugated sheeting it is often thought that the torch should be held a considerable distance from the steel as the high temperature of the inner cones of flames would heat up the base metal causing distortion. This is a fallacy. The tip should be held in contact with the steel in the normal manner but the speed of travel should be increased greatly. It is true that the high speed necessary to prevent distortion will not result in as thorough a removal of paint, rust and scale as can be accomplished on thicker sections, but nevertheless, all the fairly loose material will be removed, and above all, the surface will be dehydrated.

In general, it may be said that each particular application presents

Fig. 6. A curved tip is used for conditioning the surface of pipes

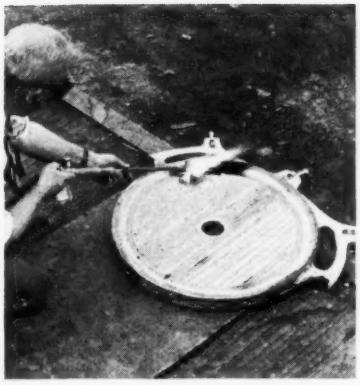


Fig. 7. A flat, wide tip is used for the reconditioning of these filter press plates

its own problems but with a few minutes trial the best technique can easily be found.

The oxy-acetylene flames should be neutral or slightly oxidizing, that is, the oxygen to acetylene ratio should be at least one. Most operators prefer a slightly oxidizing flame as the flame temperature is somewhat higher and the flame slightly more forceful. Besides, giving the oxygen torch valve a fraction of a turn after adjusting the flame to neutral assures that the flames will not become carburizing due to small fluctuations in the pressure. From the total oxygen and acetylene consumptions for many jobs followed it has been found that the average oxygen to acetylene ratio works out to about 1.15 to 1.

There are thousands of applications of flame conditioning on small structures that are overlooked because too little attention is given to these smaller jobs. As an example of one of these small applications consider filter press plates for filtering water from the porcelain mixture used in the manufacture of all types of electrical insulators. There are seventy circular grooved cast iron plates in each press. The plates are painted with a special primer and aluminum paint. These plates used to be cleaned with a hand brush prior to repainting. They lasted only about one month before they rusted badly and the grooves became plugged up, which is detrimental to efficient filtering. The cleaning with the wire brush was a prolonged operation requiring two hours for each plate and even then they were not cleaned properly. The plates are now being flame conditioned using a 2 in. wide flat tip, Fig. 7, in twenty minutes, out of which time the torch is lit for about twelve minutes. The left side of the plate in Fig. 8 has been flame conditioned showing how thoroughly the aluminum paint has been removed and the grooves cleaned out. Not only did the process cut down the labor costs for the actual cleaning but also prolonged the life of the paint. Whereas they had been lasting only one month before requiring repainting, the plates have been in service three months at the last report, and many are still in good condition. It is quite obvious that the flames had dehydrated the surface preparing for an excellent bonding of the primer to the cast iron. This relatively small application realized a tremendous saving in labor and paint costs and had led to the adoption of the flame conditioning process in this particular plant for many other applications.

Besides removing scale, rust and ordinary paint from steel surfaces several novel uses for the flame conditioning torch have come to light in the past year or so.

Removing rubber from rubber lined steel tanks has always been a problem. After considerable experimentation a method was devised that proved very fast and economical compared with former methods. A flat type of tip was used and held to the rubber until the rubber was burning, then the acetylene was turned off. The rubber under the pure oxygen burned quickly with a brilliant white light. The odor, if anything, was less, but the heat was several times greater than with the oxy-acetylene flames. It was found that by moving slowly the rubber could be burned away until there was not enough left to support combustion. However, this left considerable amounts of rubber in patches which had to be removed later with the oxy-acetylene flames and besides it was found that it was not necessary to burn away this much rubber.

If the torch was moved faster, so that only a portion of the rubber was actually consumed, enough heat was produced to soften the rubber sufficiently so that a helper with a long handled scraper, following immediately behind the burner, could peel away the remaining rubber very easily. Any streaks or patches remaining could be washed away with a chemical solvent or burned with the oxy-acetylene flames. Before the tanks are relined with rubber or any corrosion resistant coatings a fast pass should be made with the oxy-acetylene flames in the conventional manner.

The process has been found highly successful for removing many types of weather-proof coatings from concrete, stucco, or masonry. These coatings generally have an oil base and their removal by sand-blasting is practically impossible. The flame conditioning process has proven very successful for this type of work. Dragging the flames over the surface dries out the coating leaving it brittle and flaky. The coating can then be removed very easily by brushing or scraping.

The speed of torch travel was found to be quite critical. Too fast a speed did not render the coating sufficiently brittle and too slow a speed seemed to make the coating quite sticky and difficult to scrape off. The critical speed would naturally vary depending on the type, thickness and age of the coating.

Usually a primer is found under the coating and another pass with the torch is used to get down to the bare concrete. A light sandblast then prepares the concrete for reapplying the weatherproof coating or paint. On one job, five or six coats of paint were found under the primer. The second pass of the torch did not remove this underpaint but it rendered it so brittle that the light clean-up sandblast removed it completely. The process has now been used on several concrete jobs on which sandblasting had little or no effect.

Besides the weatherproof coatings referred to above it is often found that concrete structures such as buildings, grain elevators, smoke stacks, etc. have been painted with

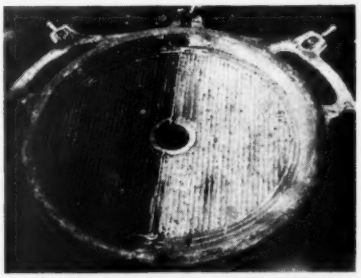


Fig. 8. The left side of this plate has been reconditioned; note how thoroughly the flame removes the aluminum paint and cleans the grooves

an oil-base paint. Often in the past when these structures needed repainting, removing the old paint was so expensive by sand blasting that either the idea of repainting was abandoned or the fresh paint applied on top of the old paint. Now these structures are being prepared for repainting by a single pass with the flame conditioning torch followed by a light sand blast.

The removal of heavy coatings of tar-base and asphalt-base paints from steel tanks has always been a long and tedious job as well as an expensive one. It was found that the oxy-acetylene flame conditioning torch could remove these coatings using a strongly oxidizing flame. On a ⅛ in. thick coating four passes were required which was rather prohibitive from the cost angle. However, the tests suggested a method which proved very satisfactory and economical. The coating was soaked with paint thinner and set afire. This softened the tar-base paint and it came off in sheets quite easily. The worst of the paint is now being removed by this method and the flame conditioning process used as a final application before repainting.

Roofing Maintenance and Repair

Explanation of strengths and weaknesses of various types of roofing . . . Vulnerability of flashings . . . Various ways in which wind damage can occur to roofing materials . . . Typical defects and remedies are outlined . . . Special hazards require special precautions and remedial measures

By J. S. SLICER, JR.,
Engineer, Associated Factory Mutual Fire Insurance

CORRECT APPLICATION backed up by careful maintenance and constant vigilance is required to keep roof coverings in perfect condition and to prevent unnecessarily extensive wind and hail damage.

The choice of the correct type of roofing at the start is of prime importance since this will mean less maintenance and less susceptibility to damage by wind and hail. Tar and gravel or slag covering is preferable to smooth surface coverings. Smooth surface coverings may be considerably damaged by hailstones, particularly if blistered, while the tar and gravel or slag coverings are relatively free from this type of damage. The usual tar and gravel surface coverings should always be used where the slope of the roof is less than ½ in. per ft but not where the slope is greater than 2 in. per ft; however, it is now possible, by using "Steep Slope Pitch", to use tar and gravel on a roof that has a slope up to 5 in. per ft. Appreciable danger of ignition from windborne burning particles does not exist with tar and gravel coverings. Smooth surface covering is an advantage where sources of leakage are to be visually located but this does not compensate for the other superior merits of tar and gravel surface coverings. The cost of the two types is about the same except for high buildings where higher costs are involved in hoisting the gravel to the roof.

Roof coverings and flashings are especially vulnerable to wind and hail damage because of their exposed position. Such damage amounted to more than $300,000 in Factory Mutual plants in five years, or about 20 per cent of the total wind damage.

Wind damage to roofs is costly not only because the roof coverings are destroyed and must be replaced but because leaky roofs allow the rain to enter and wet machinery, other equipment and stock as well as rot roof decking. Extensive destruction of the roof covering may also result in costly production delays.

Most of the damage by wind occurs to built-up roofing, either smooth surface or tar and gravel, because these are the types most extensively used. Damage can occur in the following ways:

1. Wind suction is produced over nearly flat roofs by the wind striking the wall of the building with an upward deflection. (This suction may attain a force in moderately severe winds of about 15 lb per sq ft over main roofs and about 30 lb per sq ft over monitors and sawtooth roofs and eaves.)

2. Internal wind pressure, caused by the wind breaking windows, and entering the top story of the building passes through the cracks between the roof planking and presses against the underside of the roof covering and may thus break the bond between the felts and the roof deck and eaves. (If 10 per cent of the windward wall area is opened by the wind, this additional lifting force amounts to about 15 lb per sq ft for a 70 mph wind, making a total uplift force of 30 lbs per sq ft over main roofs and 45 lb per sq ft over monitors, sawtooth roofs, and the eaves of main roofs.)

3. Prying action is caused by the wind blowing underneath the roof covering where there is a poorly nailed edge. This action allows the wind to enter and pry off large areas of roof covering.

4. Insecurely attached eave gutters may be blown loose, thus lifting the roof covering edge. Nails may be pulled out or felts pulled over the nail heads under this continued prying action.

Common defects found in built-up roofing which may allow wind or hail damage should be recognized and corrected as soon as possible. Delay in repairing a roof may mean substantially greater damage when a severe wind hits the building Although some large plants maintain competent roofing crews, the best service is usually obtained by engaging reputable roofing manufacturers. The roofer should furnish at least a 15 yr bond for the covering and preferably a 20 yr bond. A bond should also be obtained for the flashings although the period of guarantee for the flashings is usually somewhat shorter than for the main roof covering.

The best insurance against extensive roof damage is a thorough inspection of all roofs at least twice a year and a general check inspection of all eaves after every heavy windstorm.

Typical defects and their remedies are as follows:

1. Cracked roof felts.

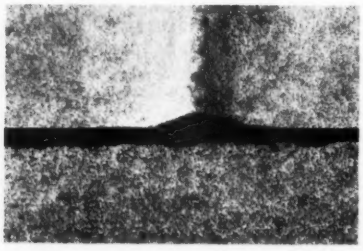
Expansion and contraction of the roof deck results in cracked blisters and loose and partially opened seams with the susceptibility to cracking increasing as the building ages. Slight cracking may be repaired by patching and remopping but extensive cracking of old roof requires covering with new felts or the replacement of the entire roof covering.

2. Blisters.

Blisters result from the improper

● Typical of the roofing defects which can be found in almost every plant are the ones shown in the photographs below

Weathered top surfaces



Fishmouths

Blisters

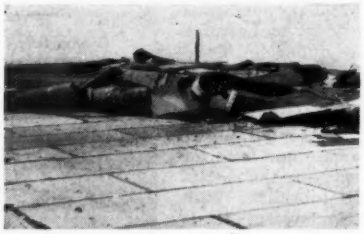
Buckles

● The wind damage which occurred to the roof coverings in these photographs was made possible, in most cases, by faulty construction or poor application and fastening of the roofing material

Inadequately fastened roof covering

Another case of poor fastening

Poor adhesion to small tile



Weak fastening of insulation

bonding of the felts. These blisters may break open when they are walked on or if large hailstones should hit them. When the roof covering has numerous small blisters a new roof is indicated since there is no satisfactory remedial treatment. Where there are a few large blisters and the remainder of the roof is in good condition, they may sometimes be cut out and the covering patched. These blisters should be removed in order to avoid excessive wind and hail damage, but in order to keep from voiding the bond, the roofer who applied the roof covering should be consulted before repairs are attempted.

When large blisters are cut out, care should be taken to make sure that the remaining felts are well bonded to the roof deck. Perforated felts are a recent development which help overcome blistering troubles, for with them the air is not trapped beneath the felts when the roof covering is applied.

3. Buckles.

Buckles may result from movement or shrinking of the roof deck. Unless they are large enough to be damaged by hailstones, the buckles do not usually require patching.

4. Fishmouths.

Fishmouths are the result of failure to roll the felts out flat. The only remedy is to remove and patch the loose felts. The felts should never be slit and mopped back into place. The proper method is to tear back the loose felt to a point where a perfect bond exists and then cut away the loose section and apply a new section of roofing.

5. Weathering.

On smooth surface roofing, asphalt top surfaces which are badly checked cannot be repaired satisfactorily, and the entire roof covering should be removed and replaced with new roofing. The weathered surface should not be used as the base for new roofing as the trouble caused by the breakdown of the original coating cannot be eliminated by the use of a new top coating.

On tar and gravel roofing, when the gravel is not sufficiently imbedded and the top coating is thin, isolated bare spots occur. The gravel may blow or wash off, causing the coating to decay and the felts to crack. More tar and gravel should be applied at once when this condition is discovered to prevent further disintegration.

If a smooth surface covering is used because plant processes cause a deposit of dust or lint on the roof, a regular and frequent cleaning schedule should be laid out to keep these deposits to a minimum.

If the planks of the roof decks are rotted from leaks in the roof covering, these planks should be removed and replaced before new roofing is applied.

It is most important that the edging strips and eave gutters be kept in good condition. Felts bent down over roof edges should be well nailed to planks with nails spaced not over three inches apart even if edging strips or eave gutters are also used. Wooden edging strips should not be used. Metal edging strips should be of zinc or copper. Heavy asphalt impregnated felt with galvanized nails spaced 3 in. apart gives satisfactory protection without edging strips.

Eave gutters should be secured if possible to the roof deck or timbers entirely independent of the roof covering. If they must be connected in any way to the covering, the gutter and attachments should be designed to resist a maximum downward load of wet snow or ice without overstressing any parts of the gutters or fastenings as well as a 45 lb per sq ft upward wind load.

When felt roofing is applied to small tile, there is a danger of poor adhesion since the mortar is likely to protrude above the tile joints so that a good bond of the lowest felt to the deck is impossible. Before covering is applied to such roofs they should be dry and free from all loose material. They should be made as smooth as possible and sufficient asphalt or tar mopping applied to overcome any unevenness and to obtain complete bonding of the felts to the tile.

When insulation is used between the roof deck and the top covering, care should be taken that the layers are mopped completely to each other and to the roof deck to insure good bonding.

In one case of an insulated roof

(Continued on page 49)

Machine Installation on Felt Floor Pads

FOOTNOTES to the article under the above title, printed on pages 26 and 41 of the August issue, were inadvertently omitted. The concluding paragraph with footnotes are reprinted below.

If the felt must be cemented to a creosoted wood block[1] floor, the creosote must be thoroughly cleaned off, to the wood, using gasoline or benzine. The wood is then covered with a thin coat of suitable cement[2] (Eagle brand or similar) which has been diluted with an equal amount of alcohol. This coating is allowed to dry for several hours and the installation is then made as described above. If it is desired to relocate the machine the cement is quickly dissolved with alcohol and the pads may be used again.

The cost of felt[3] suitable for this application runs approximately: $1.50 per sq ft for ¼ in.; $3.00 per sq ft for the ½ in.; and $5.50 per sq ft for the 1 in. material. These prices will, of course, vary somewhat with quantity, grade, and different manufacturer.

[1] Creosoted wood block floors require special care and attention to the type of block. In addition to the method outlined above there are two other methods, one using a special cement, the other cementing directly to the block, details depending upon the type of block in use.

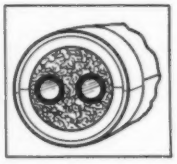
[2] Use a synthetic plastic cement. The type of cement is important for the majority of commercial rubber cements are not suitable for this purpose. Some are soluble in petroleum products. Some will stick to steel and not to concrete, some will stick to wood and not concrete, etc.

[3] These prices are in general maximum prices for small quantities. Some materials in use sell for approximately half the price shown, some cost considerably more. The actual cost depends upon the type of machine and objective of the installation.

Clay Channel Pipe for Steam Line

Contributed by
R. S. Kenyon

THE ACCEPTED method for using vitrified clay channel pipe for insulated steam lines is as follows: 1. The trench



The two illustrations show the method used when employing vitrified clay channel pipe in constructing a steam line at Akron University recently

is dug. 2. the channel pipe is split, being very careful that the two halves are brought back together again when the top part of the line is put in place. 3. The steam line is started away from the main line. 4. The bottom halves of the channel pipe are laid in a trench and the steam lines are laid in the cradle formed by these channel pipe sections. Along the top of the trench the contractor lays the matching halves of the channel pipe.

5. The insulation is packed around the steam line in the bottom half of the channel pipe. 6. The top half of the pipe is placed on with a jointing compound. 7. The insulating material is then stuffed into the top section. The insulating of these lines is completed in sections as each top section of channel pipe is put in place.

Coded Lubrication Insures Accuracy

FOR YEARS the problem of insuring that the right lubricant be used in the right place has vexed plant engineers and maintenance men. Usually it is necessary to point out to the oiler the particular lubricant to be used in each location and then depend on his memory. Where the employee has numerous applications to take care of, it is difficult for him to remember detailed instructions, and he is likely to resort to substitutions.

To overcome this handicap and insure that the proper lubricant will be used in each instance, one prominent oil company has devised a plan whereby each point to be lubricated is marked with a bright yellow decalcomania bearing a number. This number refers to the particular lubricant to be used, a duplicate decal being placed on both the storage container of the lubricant and the oil can or grease gun used for applying the specific lubricant. With this system it is therefore unnecessary for the oiler to remember the kind of lubricant required, since all he need do is note the decal number and apply the lubricant bearing a similar number.

Fig. 1. The circles indicate the number decals which are used to identify points of lubrication

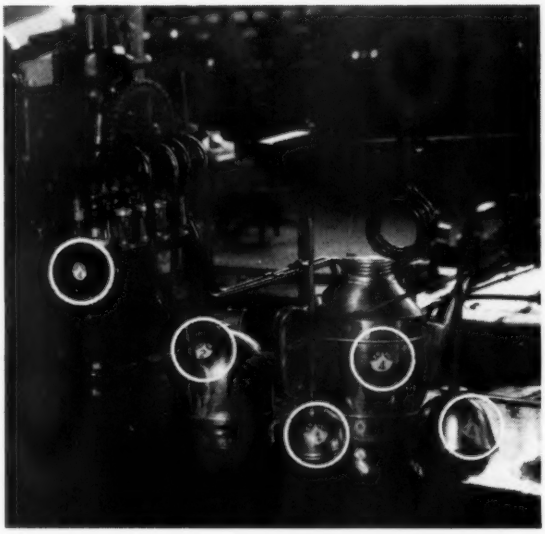


Photo: Standard Oil Company of Indiana

This plan is both simple and practical. The simple numbers can easily be distinguished. There is also no necessity for oilers to memorize grade and brand names. For this reason, grades of lubricants can be changed without disturbing the lubrication routine.

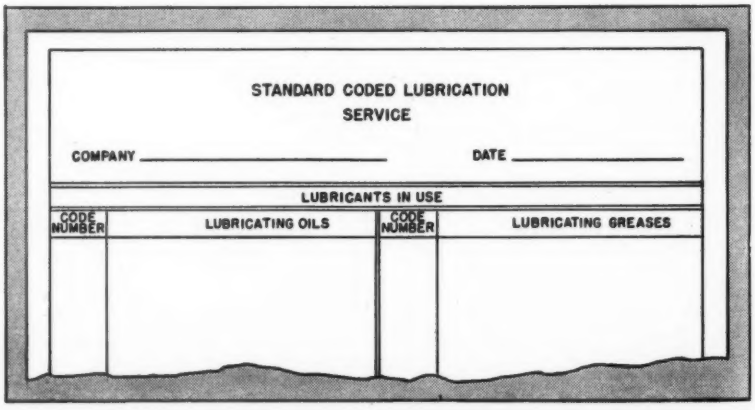
The background color of the decals is yellow, a color readily distinguished from its surroundings. Each decal carries in addition a secondary background color.

This may be had in blue or red. This two-color scheme permits, if desired, an arrangement whereby one color combination may be used to distinguish operator-lubricated points, while the other color combination is used to show points lubricated by the oiler; or grease lubricated points may be distinguished from those employing oil; or "every shift" points may be distinguished from those requiring less frequent lubrication; etc.

The uniform shape of the bright colored decals effectively marks each lubrication point. Furthermore, they are more easily applied than paint marks, have superior color permanence, wear better, and are not affected by oils or water.

In addition to the decals, where desired, a supply of celluloid protected machine record cards is also furnished, to be attached to the machines requiring lubrication. On one side can be entered the lubricant code numbers required for the machine, the number of points to be lubricated, and the frequency of lubrication.

The reverse side of the card then provides space in which to mark the

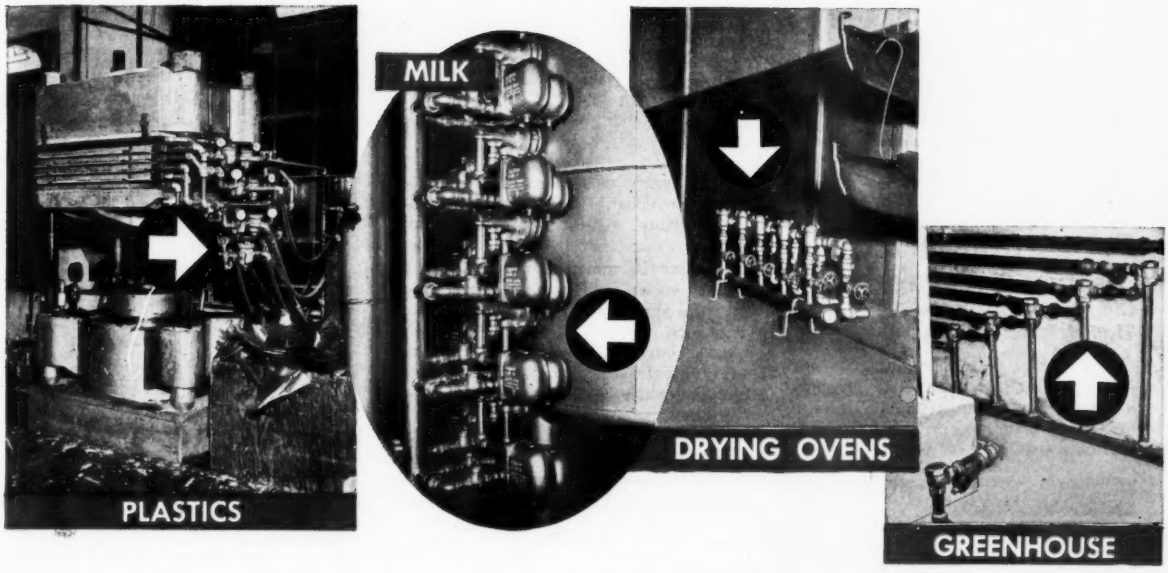

STANDARD CODED LUBRICATION SERVICE

COMPANY _____ DATE _____

LUBRICANTS IN USE

CODE NUMBER	LUBRICATING OILS	CODE NUMBER	LUBRICATING GREASES

Fig. 2. This is the card which is used for control purposes and for recording brand name and code numbers of all lubricants



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When you buy steam traps, it pays to use just as many as necessary to assure efficient drainage and venting of every individual unit.

That's why you see so many batteries of Sarco Steam Traps. Each of the four types illustrated has special advantages of its own. All have the "know how" of Sarco's experience and the precision that results from being made in a plant devoted exclusively to steam traps and temperature controls.

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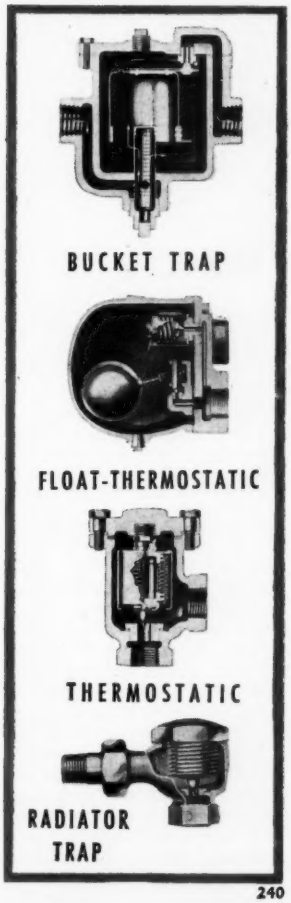
Small plants can profit by this advanced knowledge merely by asking for a Sarco recommendation. Your heating engineer or the nearest Sarco Representative can get this for you. And don't overlook the various forms of Sarco hot water, process and cooling controls.



240

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lubricant to be applied to each machine part and other specific details.

For control purposes, a card is also supplied on which to record the brand name and code numbers of all lubricants used throughout the plant (See Fig. 2). This enables the stockkeeper to requisition products by name, and to mark dispensing containers with the proper decal.

Protection at High Temperatures

Contributed by Thomas Trail

HERETOFORE, equipment surfaces subject to high temperatures have presented a serious protection problem. Industry has been constantly on the lookout for products that will reduce the high cost

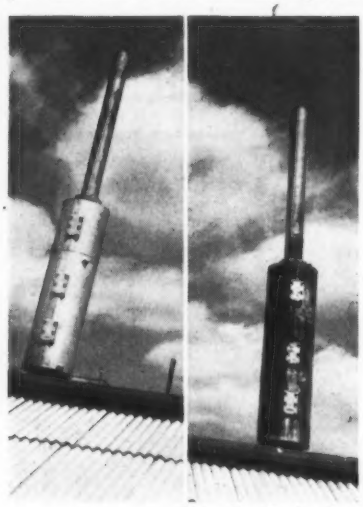


Photo: Dow Corning Corp.

The badly rusted exhaust muffler at the right was painted with conventional paint on the same day the muffler at the left was painted with silicone paint, aluminum pigmented. Both were exposed to weathering, chemical fumes and temperatures of about 500 F for 18 months

of maintenance and replacement. In recent years, the development of silicone chemistry appears to offer an unusual advance in the field of protective coatings. By the use of silicone resin vehicles, paints and enamels have been developed that will withstand continuous exposure to temperatures of 500 F.

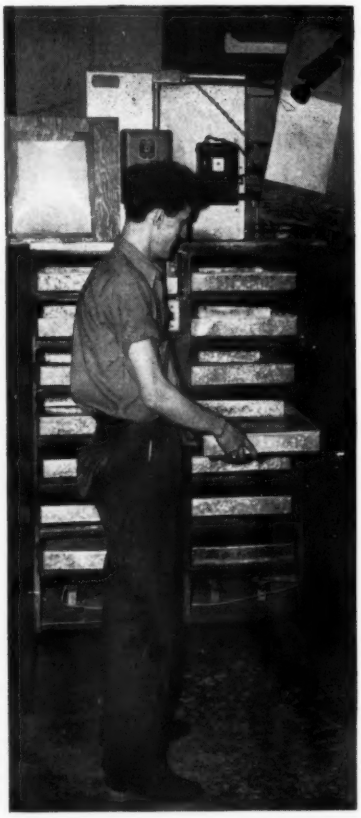
In addition to their heat resisting qualities, paints and enamels made with a silicone resin base possess high resistance to moisture, oxidation and ultraviolet rays. A simple coating, consisting of aluminum powder combined with silicone resins, has met with considerable success when applied to metal exposed to the weather and subjected to surface temperatures ranging from 430 to 510 F. Silicone paints do not chalk, and white silicone enamels do not yellow with age. The silicone composition of these paints and enamels can be varied at will so as to produce coatings having any desired degree of flexibility or hardness.

Plastics Firm Designs Preheating Ovens

Contributed by Walter Rudolph

THE OVENS USED for preheating of plastics by Franklin Plastics Div. greatly resemble regular commercial preheaters, but the company considers them, for its purpose at least, to be greatly superior. Galvanized pans slide into the shelving through double doors as shown in the photograph. Drums of plastic powder are located near the oven and the molder fills the oven pans during periods between his other duties.

Preheating peak of about 240 F is reached in these ovens through the circulating air principle. The pans are smaller than the shelves on which they rest and thus the heated air can pass through the side opening and through a portion of the central openings on alternate shelves. Material is usually kept hot in these ovens for about 6 hr eliminating practically all moisture. The press operator dumps material from the oven pans as needed and molding speed is gained through the use of material already heated when it enters the press.



This plastics company designed its own preheating ovens. Galvanized pans are first loaded with plastics by operator. The heat is then brought to 240 F and heat circulates from six resistance heaters located at the bottom of the oven through side and centrally located slits in shelving

Use Bronze Rod for Rebuilding Surfaces

Contributed by Linde Air Products Co.

PLANT MAINTENANCE foremen are finding bronze welding rod extremely valuable for rebuilding worn engine parts. When sliding friction causes parts to wear out, they can be easily reclaimed by applying wear-resistant bronze rod to the worn surfaces. A few typical applications are shown below. You can probably think of many more.

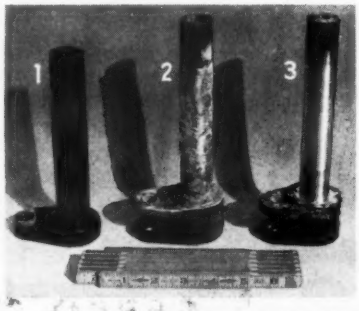


Fig. 1. Rebuilt rocker-arm that lasted as long as a new arm. Used in reciprocating pump, these arms wear ⅛ in. on the diameter in six months. (1) worn arm; (2) another arm bronze surfaced; (3) machined, ready to use

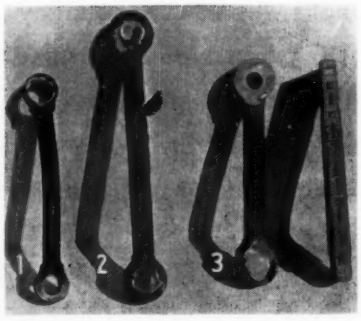


Fig. 2. How rocker-arm links may be rebuilt. (1) the worn link; (2) link reclaimed by filling hole with bronze rod; (3) hole drilled to correct size

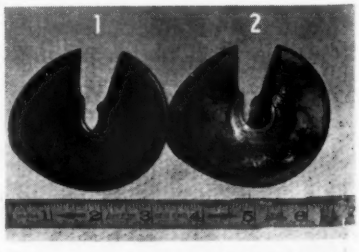


Fig. 3. This photo shows lock-washer that usually lasts only 6 months. But when it's rebuilt with bronze welding rod it gives a full year of service

Roofing Maintenance and Repair

(Continued from page 45)

where the top layer was stapled to the lower layer, extensive wind damage resulted when the insulation separated due to the staples not being clinched.

Whenever roofing operations are being undertaken, there is the danger of fire starting from heated kettles and the use of combustible materials. Fire hose and first-aid fire fighting equipment should be constantly available. Someone should be made responsible so that no undue fire hazards are permitted and suitable supervision should be provided so that any incipient fire may be extinguished or the alarm given promptly.

Elevator Maintenance

(Continued from page 29)

The phase-reversal-protection relay should also be checked occasionally.

Motors should be watched for signs of dry or brittle insulation. The windings should be cleaned with oil at least every 2 yr in the case of a frequently used elevator and coated with a good insulating varnish. The commutator, and also the commutator on the motor-generator set, where used, should be cared for in accordance with usual practice.[1]

Switches, motors, etc. used on dc. will, of course, require more maintenance and attention than those operated on ac. The inspection should also include examination of door closing and opening equipment, cam operating devices, signal systems, automatic leveling, and other devices. Examine the brake for drag and wear. The lining should clear the wheel about the thickness of a hacksaw blade.

As a fire prevention measure, the hoistway should be thoroughly cleaned at least once a year. Nothing burns faster than oil soaked dust clinging to the sides of this perfect chimney.

The accompanying form for use by the maintenance man at the time he makes his inspection will be found useful. Items which do not appear on your elevators can, of course, be omitted. The mechanic fills in the date at the top of the column and writes OK or X opposite each item. Whenever he marks an item X he notes the date, item, and reason for the X on the back of the form. A record is thus kept of: recurring trouble on any piece of equipment; rope replacements; major shutdowns; vandalism, and information necessary to intelligent maintenance planning. This form will also help in setting a maintenance standard.

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Questions and Answers

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A Brain Teaser for the Puzzle Fans

Contributed by
M. Podell, New York City

THE PROBLEM printed on page 35 of the August issue was to identify a number of conductors in a long conduit by making one trip to one end and two trips to the other. In the following sketches, Figures 1, 2 and 3, the wiring is shown outside the pipe or conduit for clarity and

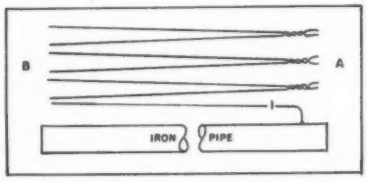


Fig. 1. Condition after the electrician leaves manhole A

the problem is solved in three steps.

Step 1. When the electrician first stops at manhole A and selects one wire. This is tagged No. 1 and is attached to the pipe so as to make an electrical contact. The remaining wires are grouped in pairs.

Step 2. He next goes to manhole B and locates the No. 1 wire by means of the bell. This is tagged No. 1. He then picks a set with the aid of his bell and tags them No. 2 and No. 3. He then connects No. 2 to No. 1. He locates the remaining pairs and tags and connects them in the proper manner and sequence.

Step 3. He then goes back to manhole A and breaks the electrical connection on each pair, but keeps the pair together with a piece of tape. He then locates No. 2 which is in the circuit with No. 1 and tags it. This gives him No. 3 and No. 4

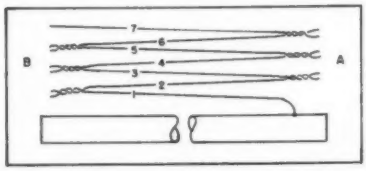


Fig. 2. Condition after the electrician leaves manhole B

which are tagged before proceeding to the remaining pairs. The odd wire

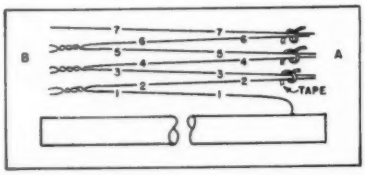


Fig. 3. After a second trip to manhole A the job is complete

No. 7 will not ring with any wire. Although seven wires are shown in the example, the solution is not limited and can be used with any number of conductors.

What Floor Paint Resists Creosote?

Contributed by
R.J.S., New York City

QUESTION: The housekeeping in our company takes a high spot in the priority of "work to be done." This has called for extensive painting of floors, walls, ceilings and exteriors of buildings. The attention given to paint and color schemes in PLANT ENGINEERING makes me believe that perhaps some other readers can help me with this problem.

A retort house, in one of our plants, has the exterior painted with aluminum paint. The tanks are painted with the same paint. Trim around windows and doors is black. Inside, the floor is painted red, the pumps are gray, the tanks are aluminum and black. This look fine until a gasket blows and creosote leaks onto the floor. Not only is it hard to clean up but it also discolors the floor paint. Can anyone tell me what kind of paint is unaffected by creosote? What color schemes are other plants using on motors, pumps, piping, tanks, etc.?

Reconditioning Rusty Threads

Contributed by
H. Mack

Question: Can any readers suggest a really reliable method of loosening rusty threads? I have often been confronted with the problem of dismantling machinery when no penetrating oil was available and usually we wind up with stripped or broken bolts.

Answer: Many mechanics have seen rusty steel bolts twist off when someone was trying to loosen the nuts without preparatory work. When no penetrating oil is available you still have cheaper methods available. One of the most reliable is the simple expedient of soaking the threads in cold water.

Sometimes this suggestion is met with a contemptuous snort. One mechanic whom I knew had a tremendous amount of fun from his "secret formula" which he kept in a small bottle in his pocket. One day he was discovered at the water tap refilling the "formula" and the secret was out.

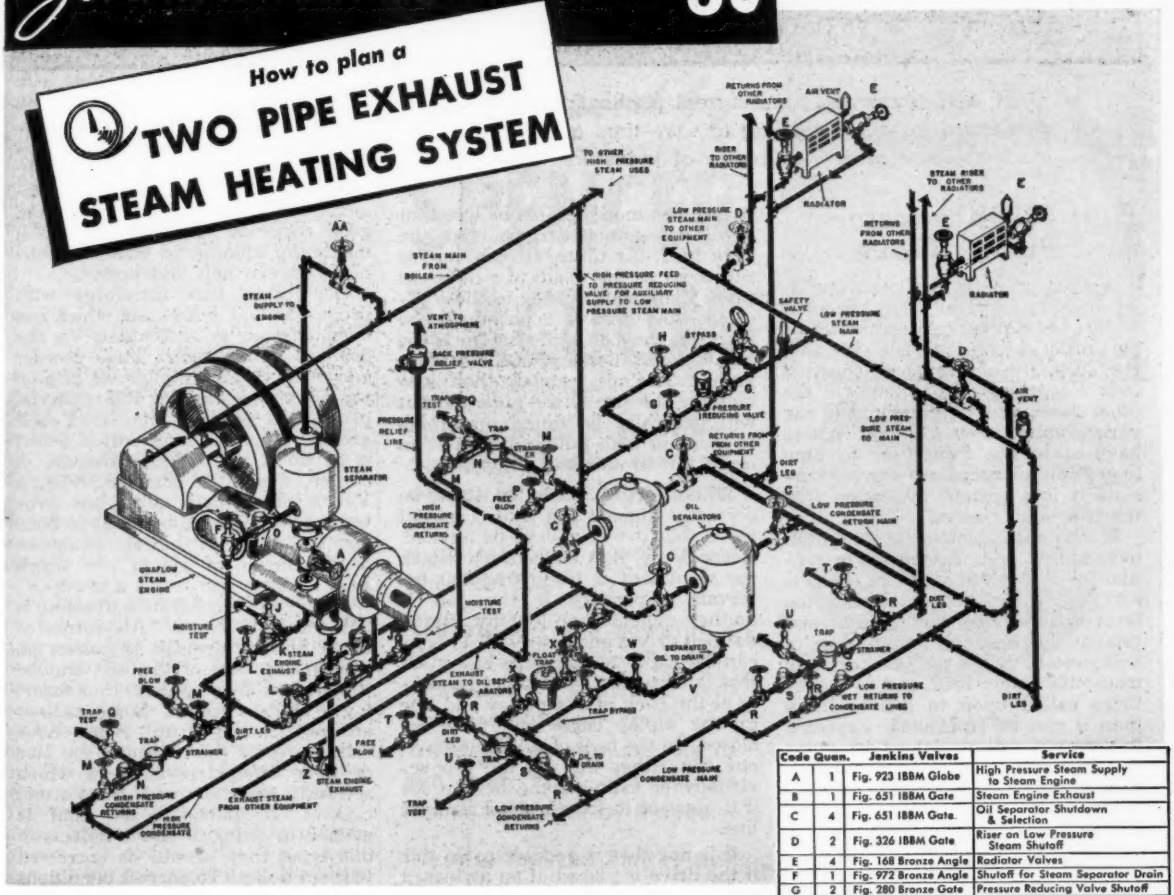
The use of water may seem paradoxical but it actually works. The water should be applied generously and the rusty bolts, studs or nuts given a good soaking. When possible, allow the part to soak, completely submerged. When this is not possible, first, apply the water and then cover the bolt with a piece of water-soaked waste.

I can well remember one instance where the water cure came in handy. We were doing a job on some crane outrigger jacks when we encountered some 3 in. by 18 in. U.S. coarse threads. They had lain out in the weather for 10 years with no protection; the case looked absolutely hopeless. But there was plenty of water available so the mechanic tied those four heavy bolts on a rope and let them down into the water to soak over night. Next morning the bolts were retrieved, and a pair of 36 in. pipe wrenches were applied to the nuts. One good heave on each and the nuts were loose. The idea has been used successfully a great many times, to my personal knowledge; it has always worked.

It is well to establish a definite lubrication schedule for motor bearings and adhere to it. Charts or files should be maintained for keeping a record of all lubrication procedure, thus insuring that each bearing will get correct attention at the proper intervals and that none will be inadvertently overlooked. Information should also be available as to the particular requirements of each type of bearing, with attention given to service and location factors.

Jenkins PRACTICAL PIPING LAYOUTS 35

How to plan a TWO PIPE EXHAUST STEAM HEATING SYSTEM



Code	Quan.	Jenkins Valves	Service
A	1	Fig. 923 IBBM Globe	High Pressure Steam Supply to Steam Engine
B	1	Fig. 651 IBBM Gate	Steam Engine Exhaust
C	4	Fig. 651 IBBM Gate	Oil Separator Shutdown & Selection
D	2	Fig. 326 IBBM Gate	Riser on Low Pressure Steam Shutoff
E	4	Fig. 168 Bronze Angle	Radiator Valves
F	1	Fig. 972 Bronze Angle	Shutoff for Steam Separator Drain
G	2	Fig. 280 Bronze Gate	Pressure Reducing Valve Shutoff
H	1	Fig. 976 Bronze Globe	Pressure Reducing Valve Bypass
I	1	Fig. 970 Bronze Globe	Pressure Gage Control
J	2	Fig. 970 Bronze Globe	Moisture Test for Starting-Up Engine
K	2	Fig. 962 Bronze Swing Check	Prevent Backflow to Cylinder
L	2	Fig. 280 Bronze Gate	Engine Cylinder Drains for Starting-Up
M	4	Fig. 280 Bronze Gate	High Pressure Steam Trap Shutoffs
N	2	Fig. 962 Bronze Swing Check	Prevent Condensate Backflow
O	1	Fig. 962 Bronze Swing Check	Prevent Condensate Backflow to Separator
P	2	Fig. 970 Bronze Globe	Free Blows on Condensate Returns
Q	2	Fig. 970 Bronze Globe	High Pressure Trap Test
R	5	Fig. 47 Bronze Gate	Low Pressure Steam Trap Shutoffs
S	3	Fig. 92 Bronze Swing Check	Prevent Backflow of Low Pressure Condensate
T	2	Fig. 106-A Bronze Globe	Low Pressure Condensate Free Blow
U	2	Fig. 106-A Bronze Globe	Low Pressure Trap Test
V	2	Fig. 92 Bronze Swing Check	Prevent Backflow to Oil Separators
W	2	Fig. 47 Bronze Gate	Oil Drain on Separator Shutdown
X	2	Fig. 47 Bronze Gate	Oil Float Trap Shutdown
Y	1	Fig. 106-A Bronze Globe	Float Trap Bypass
Z	2	Fig. 624 IBBM Swing Check	Prevent Backflow to Engine Exhaust
AA	1	Fig. 204 IBBM Gate	Main Steam Supply Shutoff

A typical piping installation in a plant where exhaust steam from a prime mover is used for heating, low pressure processing, and hot water heating is shown in this layout. The prime mover may be a steam engine, turbine, or direct-acting pump, non-condensing.

The steam prime mover is operated non-condensing with an exhaust pressure from 2 to 5 p.s.i., and head pressure on the engine from 100 to 400 p.s.i. A back pressure relief valve discharging through an exhaust head to the atmosphere prevents back pressure build-up on the engine when the steam demand cannot use all exhaust available.

The heating system is a two-pipe up feed system with quick-vent valves on the mains and air valves on radiators. Convectors, unit heaters, or projection heaters may be used instead of radiators.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation. Copies of Layout No. 35, enlarged, with additional information, will be sent on request. Just mail coupon.

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Plant Engineer's Digest

Short articles selected from current publications and condensed for quick reading to save time and give quick reviews of a wide range of industrial topics

Belt Maintenance and Pulley Care

A BELT properly designed for its job and well looked after has what might be termed a "comfortable" amount of sag on the slack side, and the curve so produced is constant over a long period of time. On the other hand, when the amount of sag varies appreciably so that pieces have to be cut from time to time to provide the necessary driving tension, it is a certain indication that the belt is overloaded.

Much depends upon the amount of overloading and whether it is regular or intermittent. If a belt is carrying a constant overload, the fault is shown by the gradual and regular increase in length due to belt stretch. But if the belt normally transmits a fair load and is sometimes called upon to deliver more than it can be reasonably expected to carry, it will stretch at irregular intervals or, in bad cases, slip. Cutting pieces out does not correct the fault; in fact, it aggravates it, though this is a slow process and generally passes unnoticed. When slip is taking place what is usually needed to correct the condition is either a stronger or more flexible belt, so that it will be capable of transmitting the peak load. At times, stretch and/or slip occur as the result of a different cause than overloading. In these instances the answer is mostly to be found in the belt stiffness being too great for the diameter of the smaller pulley. The only remedy then is to increase the size of the pulley and it will generally be found preferable to increase both pulley diameters in order to maintain the same ratio.

When a drive is installed it may be correctly aligned but that does not mean that it will always be aligned. Accordingly, it is advisable to check the alignment at fairly frequent intervals, especially if the job is neither difficult nor lengthy. Many flat belt drives and nearly all V-belts can be sight tested with ease. All that is necessary is to stand squarely at the back of one pulley and line up the pulley edges with one eye closed. In the case of a V-belt drive, one can either line up the grooves visually or examine the belt to see if it appears to form a dead straight line.

It is not always possible to do this if the drive is placed at an awkward angle, since the lower pulley could easily be too low to enable the sight tester to get into the correct position; then the best way out is to stop the drive and apply the string test.

Pulley faces should always be examined to determine that they are in good condition and that there is a maximum amount of effective contact between belt and pulley.

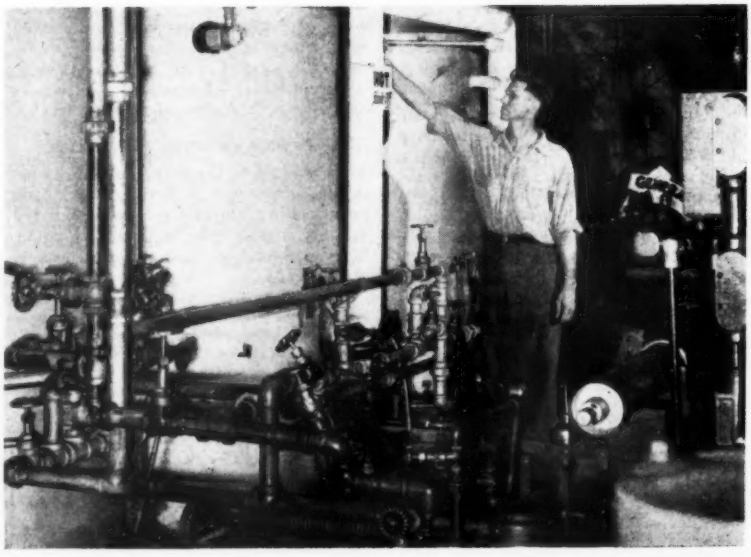
One thing that interferes with proper contact is dressing which has been allowed to accumulate on the driving surfaces—dirt, dust, powder and other foreign matter settling on top so that a wad of this material prevents a positive bite. In V-belt grooves much the same sort of defect is at times noticeable, although, of course, it is not so common. When a V-belt occasionally slips, the protecting fabric envelope tends to burn and this leaves a thin accumulation on the inside of the groove which soon hardens and forms a crust.

But even with flat belt, dressing is not the only cause. All forms of dusty powder are apt to collect on the driving face of the belt and be transferred to the pulley, thus forming a shifty cushion. Some pulleys are not exactly true. Some have ridges around the center of the face or have other irregularities which seriously interfere with the normal contact. A glance is all that is needed in order to notice defects of this type; they should be corrected without delay. To correct conditions of this type the pulley must be dis-

Oil Salvage Program Pays Utility

UNION ELECTRIC's oil reconditioning plant in its Utility Shop is the next best thing to a private oil field. Here, some 80,000 gal of old, sludgy oil are revitalized each year. The first batch of oil went through the plant in December, 1944 and the process has salvaged from 1,200 to 1,800 gal per week since. Technicians say it is being reconditioned at a cost of about 6 cents per gal; new oil is 22 cents.

Generally, oil doesn't lose its body. It merely becomes dirty and collects water and acid. Remove these elements and old oil is good for another tour of duty. Every drop which has passed through the reconditioning process has come out to meet the most exacting standards for service in electrical equipment throughout the system. *From Union Electric Quarterly a publication of Union Electric System, St. Louis.*



These huge oil agitating tanks are part of the reconditioning equipment at Union Electric's Utility Plant. Six hundred gallons of oil goes into the center tank every other day. Tri-sodium phosphate, heat and compressed air agitation start the reconditioning

mantled and the protuberances machined down to leave a perfectly even and smooth surface. If the pulley is of the crowned type, it is important to see that the camber is slight but exactly balanced.

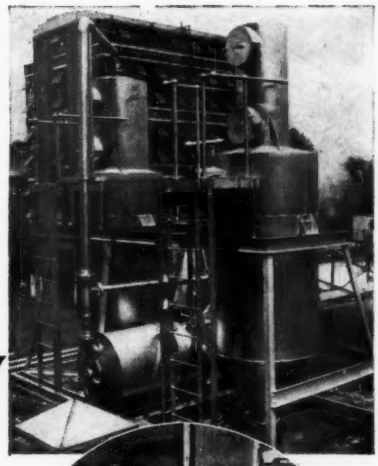
An opportunity of checking the condition of splices in endless belts should never be missed. A splice failure is generally sudden, but the cause of the failure is a slow methodical process. Therefore, if attention is given to a defect in the early stages, there is no real reason why the joint should not be reconditioned promptly to enable the belt to deliver its full measure of value in service. When the tip of a belt lifts away from the body of the splice the belt needs to be taken off the pulleys and the splice remade. Patching up will not provide a lasting cure; rivets driven through the loose tip to hold it to the rest of the belt do not arrest the pulling away tendency. The splice must be opened up, thoroughly cleaned on both faces to remove all the old cement, re-cemented all over and pressed long enough for the joint to form a positive bond.

A different type of splice trouble to be found with fabric belts is where bubbles of air develop underneath the top ply. This is due to precisely the same cause as air cushions, which have at rare intervals, been known to form in these belts. Either inferior cement or an insufficient quantity of good cement is sometimes the root of the trouble. The two faces which ought to be firmly bonded together fail to adhere where the solution is not good enough for the work and the plies are therefore separate entities.

When leather is subject to heat of more than 100 F the oils and fats which the belt manufacturer put into the material (to replace the natural ones destroyed in the tanning process) dry out rapidly and leave the internal fibers dry and harsh. In flexing round the pulley arcs, the rough fibers grate upon each other, and, as there is nothing to lubricate them, they are apt to break. The belt then disintegrates. What is actually needed is a suitable dressing to be applied to the outside, so that the fibers will absorb all the oil they require.

At the opposite extreme, when oil, dressing or other foreign matter is allowed to collect in and on the belt, the normal contact between belt and pulley may be interfered with. And there may be a chemical action going on which tends to destroy the texture of the belt. In either event, it is good policy to remove the foreign matter at once. This can be accomplished in two ways — either by loosely coiling the belt inside a wooden box and covering all the leather with sawdust. French chalk or some other equally absorbent powder, and leaving for a few days. The alternate method is to spread

Spencer Vacuum Equipment on roof of chemical plant



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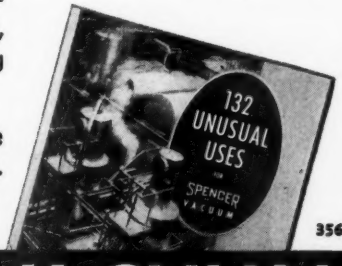
Ask for the bulletin and see where and how Spencer fits in your plant.



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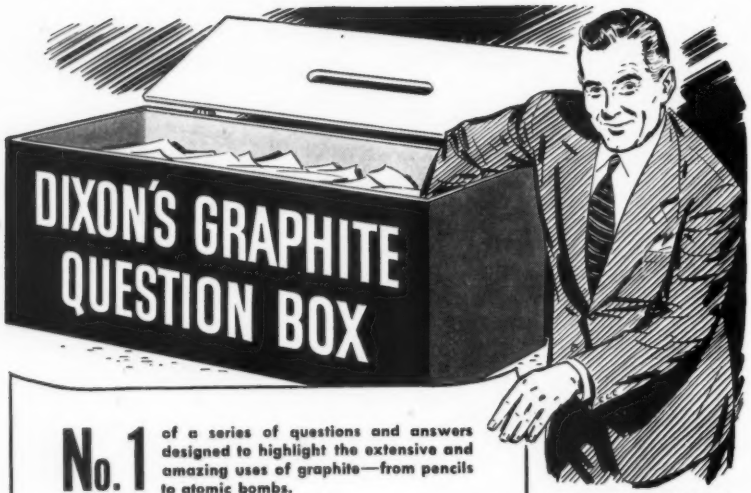

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QUES. Where are the principal commercial sources of graphite?

ANS. Madagascar, Ceylon, Mexico and Korea. Some are found in the United States.

QUES. Is there more than one type of graphite?

ANS. Yes. The natural crystalline type is found in laminations of very thin flakes and in vein-like strata of fibrous structure. The natural amorphous type is of rather earthy structure.

QUES. Which type of graphite is obtainable in the highest purities?

ANS. The crystalline varieties, after refinement, run highest in graphitic carbon.

QUES. In what average particle sizes are processed graphites available?

ANS. Over an extremely wide graduated range from an average of 2 microns to large flake sizes containing particles from ⅛ to 2 millimeters.

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the belt full length along the floor with the absorbent powder completely surrounding it. The effect is the same in either case—the dry powder extracts the superfluous moisture from the belt in a few days and leaves it comparatively free.

In extreme cases when the belt is literally full of oil and is not cleaned by one application, it may be necessary to repeat the treatment. If a greasy deposit is present, it is best first to remove the surplus with a blunt knife before applying the powder. After this the leather should be washed in warm, soapy water and thoroughly dried. Operating conditions must always be taken into consideration when specifying types of belt drives. Steam, water, acid affect different materials in different manner.—*From Power Transmission, a British publication published by the Trade and Technical Press, Ltd., Chancery Lane, Holborn, London.*

Plastic Insulation for Interior Wiring

ALL PLASTIC sheathed cables for 250 and 660 v are being installed in permanent building circuits in Great Britain and at least two of the British Dominions. New Zealand Industries, Ltd. manufacture cable of this type using Vinylite plastic compounds VG-5901 Series unfilled general purpose primary insulating compound for conductor insulation, and VG-9530 Series low cost jacketing compound for the outer sheath.

These cables are constructed and specifications laid down by the New Zealand Government. The company has found that the best field performance is obtained by applying the sheath to the insulated conductors laid side by side and in the same plane with the grounding wire.

Cables with the grounding conductor laid in the valley between two cores are unsuitable for use in take-up devices employing capstans. Used in this way the grounding wire must follow either the greater or lesser circumference as the cable is pulled around the small diameter cylinders, which results in kinking and piercing of the outer sheath.

One of the main features required by the electricians for successful installation is that the outer sheath shall strip back easily and readily from the conductors. The desired result may be achieved by freely coating the insulated conductors with french chalk before they enter the die for the sheath extrusion. (The original includes wire tables, classifications and tests as covered by the British regulations covering the construction, testing and insulation of plastics insulated and sheath cable.) *From Kabelitems No. 27, a publication of the Bakelite Corp., New York, N. Y.*

Watch Your Plant Windows and Doors

Contributed by Silvanus Smith

In most sections of the country the Winter winds will soon be blowing, and if your windows and doors are not tight, you will be wasting money on high cost fuel during the heating season.

See that the space between window and door frames, and construction of brick, concrete, cinder or cement block, hollow tile, asbestos board and metal siding, are properly filled with a good calking compound. This is generally applied with a calking gun or from cartridge of some type.

Replace all broken glass and loose putty. Before applying new putty on wood sash, be sure to coat the bare wood with a good paint primer and allow to dry. Otherwise, the oil of the putty penetrates into the wood, and the putty will soon dry up and fall off. On wood sash, use only a pure linseed oil and whiting putty, and for steel sash obtain a special steel sash putty of a reliable manufacturer.

If the steel sash seems to be rusting, remove all rust with sandpaper, and apply a good rust inhibitive primer immediately. Allow to dry before finish coat is applied.

If wooden sash, doors and exterior trim of wood has not been painted for over three years, they should be given two coats of paint, in accordance with the recommendations of a reliable paint manufacturer. If dark colors, which cannot be made of the durable white pigments, are desired, a primer of the right type should be used, followed by a finish coat of a Trim Color, generally made of chemically pure colors, which do not fade, combined with a long oil-synthetic resin reinforced vehicle of some make.

Steel sash, gutters, conductors and metal trim must be protected from the elements in order to avoid expensive decay. After removing all rust, and applying to the bare iron or steel a good rust preventive, maximum protection is secured by a coat of a high grade alkyd resin enamel. An enamel produces a more waterproof and durable film than paints made for use on wood and similar materials.

With the high cost of labor, it is now more important than ever that we properly protect all exterior surfaces against decay. When these surfaces have been properly painted, it will be found most economical to then plan to apply one finish coat of paint on wood, or enamel on metal, every three years.

The calking, puttying and painting will not only improve appearance and protect but will insulate against heat, cold and dirt.

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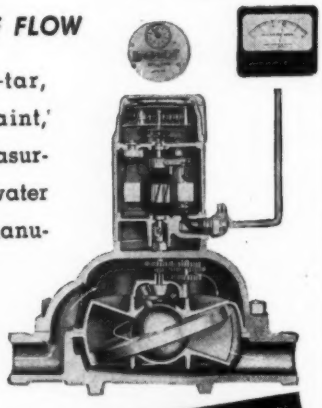

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Plant Engineer's Library

Concrete Design Tables

Reinforced Concrete Design Handbook of the ACI: Size 6 by 9 in.; 132 pp; fabricoid binding; published cooperatively by four associations including the American Concrete Inst., Detroit, Mich. Price $2.00.

Handbook of Frame Constants, Beam Factors and Moment Coefficients for Members of Variable Section; Size 8½ by 11 in.; 32 pp; paper bound: Published by The Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill.

These companion volumes cover information in tabular form arranged to facilitate the design of re-inforced concrete frames, bridges and structures involving haunched members of structures.

The first volume includes 43 tables and diagrams, preceded by some discussion, mostly in the form of examples showing the use of the tables. These examples are divided into groups covering flexural members, stirrups, columns concentrically and eccentrically loaded, and footings.

The second volume consists almost entirely of tables with a short explanation on the use of the factors of carryover, stiffness and fixed end moment coefficients for uniform, concentrated and haunched loads. A typical example precedes the table so that the designer need not concern himself with the discussion following the tables unless he is particularly interested in the mathematical derivations.

Pilot Plant Experimentation

Industrial Experimentation by K. A. Brownlee. First Edition; size 5½ by 8½ inches; copyright 1947; 152 pages; cloth bound. Published by Chemical Publishing Co., Inc. Price $3.75.

This book is designed primarily for the use of those concerned with pilot-plant and plant-scale experiments on chemical manufacturing processes. The statistical methods presented have long proved to be of great value in other fields of experimentation, notably agriculture. Those who must apply critical tests of statistical significance in practice, often without a full knowledge of their theoretical background, will find that this volume is particularly useful.

It is a guide to both the planning and interpretation of expriments on an industrial scale and paves the way to efficient quality control. The subject is treated entirely from the practical point of view. Theory is at a minimum and the only mathematics involved is simple arithmetic.

Each statistical method discussed is illustrated with practical examples

worked out in detail to show what exactly is involved in its use. Some of the more advanced techniques may appear rather formidable but it is strongly recommended that they should be approached through the use of the simpler methods.

Fluid Mechanics for Designers

Fluid Mechanics of Turbomachinery by George F. Wislicenus. First edition; size 5½ by 8 in.; 613 pp; illustrated; cloth bound. Published by the McGraw-Hill Book Co., Inc. Price $7.50.

This is a treatment of flow problems encountered in the design of: water, gas and steam turbine; centrifugal or axial flow pumps and compressors; and propellers; hydraulic torque converters and couplings. The treatment is intended for practical use by mechanical, automotive and aeronautical engineers and gives careful attention to advances in the field of fluid mechanics as far as they can be applied to the theory of turbomachinery. The presentation covers the one dimensional theory of turbomachinery, the mechanics of compressible fluids and the geometrical form of design. While it cannot be considered an elementary introduction to general fluid mechanics, those principles of this field which have been used in the book are derived independently of other publications. To this extent the book has been made a self-contained unit.

Smoke Prevention

Proceedings of the Annual Meeting, Smoke Prevention Association of America, Inc., 1947. 120 p.; illustrated; size 8½ by 11; paper bound. Published by John Paul Taylor, Publisher. Price $2.50.

This large volume contains all the technical as well as the general paper presented at the 1947 annual meeting. It contains up-to-date and authoritative information on practical methods of preventing smoke. Each paper was written by an authority in the field. Book also contains the discussion on each paper which came from the audience.

General smoke prevention practices and how they may be applied to industry, railroads, and city smoke prevention groups are discussed thoroughly by men actually engaged in and responsible for smoke prevention.

Illustrations are mostly drawings from which it is possible to apply this information to a particular case.

Hydraulic Equipment

Hydraulic Machinery by Samuel R. Beitler and Eric J. Lindahl, First edition, 218 pp; illustrated; size 6 by 9 in; cloth bound. Published by Irwin-Farnham Publishing Co. Price $3.50.

Mr. Beitler, Professor of Hydraulic Engineering at The Ohio State Uni-

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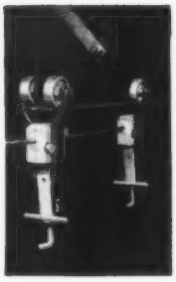

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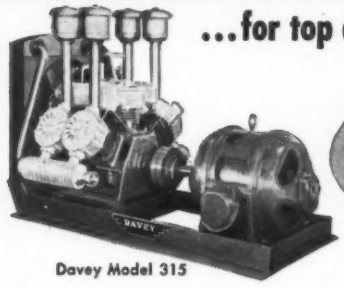

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Write for Bulletin E-219

DAVEY

P&P-102

DAVEY COMPRESSOR CO. *Dealers in Principal Cities*

versity, has been intimately connected with research in flow and hydraulic for many years and carried out much of the original investigation in this field. He and his coauthor have based this book on notes used in teaching courses in hydraulic machinery to upperclass students in Mechanical Engineering. The book is well illustrated especially with phantom views and cross-sections of practical, operating machinery and should be quite valuable to practicing engineers in studying this equipment.

The term "hydraulic machinery" applies to more than pumps and turbines for the practicing engineer deals almost constantly with pipe lines, meters, power transmission equipment, etc., which are truly hydraulic machines. They are all covered in this book. For the practicing engineer, the fundamentals of fluid mechanics are reviewed to help him in solving specific problems in that field.

Safety in Electrical Work

National Electrical Safety Code, NBS Handbook H30. Size 5 by 8 in., 408 pages, cloth bound. Published by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price $1.25.

The first five parts of the Code, originally issued separately as handbooks H31 toH35, have been incorporated in this single volume. Sections of the Code were originally prepared in answer to the large number of fatalities occurring among electrical workers. While primarily intended for the public utility field it is useful and has a wide application in industrial practice.

The first section covers installation and maintenance rules for electric supply stations, Section 2, electric supply and communication lines, Section 3 electrical utilization equipment, Section 4 safety rules for the operation of electric equipment and lines and Section 5, radio installations. In part 2 is given the strength requirements for overhead lines and supports in all parts of the United States, based upon a long-range study of wind velocities and weather conditions favoring ice accumulation.

Report on the Making of Synthetic Petroleum

Synthetic Petroleum for the Synthine Process by B. H. Weil and J. C. Lane. Copyright 1948; size 5¾ by 8¼ in.; 304 pages; cloth bound. Published by Remsen Press Div., Chemical Publishing Co. Price $6.75.

This is a pioneer book on the synthine process of making oil from natural gas, shale, coal. It presents a detailed account of the technical and economic phases of this subject which is so important to the petro-

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leum, coal and chemical industries. Unusually complete in itself it is fully documented with references to thousands of patents and articles and contains a complete list of government reports.

In this book the authors have logically treated the subject matter under four main headings: 1 production and purification of the synthesis gas; 2 catalytic synthesis reactions; 3 products, byproducts and derivatives; 4 basic economics and current developments. Much attention is given to the theoretical and engineering phases of the process with unusual emphasis on the nature and yield of products and by-products.

Steel Beam Fatigue Strength

Flexural Fatigue Strength of Steel Beams by Wilbur M. Wilson. Copyright 1948; size 6 by 9 in.; 33 pages; illustrated. Published by University of Illinois, Urbana, Ill. Price 20 cents.

This booklet is one of the regularly-published Bulletins of the University. The main purpose of the investigation reported in this bulletin was to determine the relative fatigue strengths of beams used in bridges and like structures. Description of the tests as conducted is presented in the booklet and full findings are reported largely in the form of drawings and tables.

Welding Storage Tanks in the Field

Standard Rules for Field Welding of Steel Storage Tanks. Size 6 by 9 in.; 18 pages, paper bound; illustrated. Published by American Welding Society, 33 W. 39th St., New York City. Price 50 cents.

The 1947 edition of this book presents the standard requirements for arc and gas welded construction of bulk storage tanks for holding liquids at substantially atmospheric pressure. The edition contains revised materials standards and makes provision for welding plate thicknesses up to 2 in. Revisions have also been made in the requirements for inspecting shell joints by sectioning methods.

The Rules contain complete provisions for welding, including material, design, workmanship and inspection requirements. An appendix is also included referring to the general specifications covering unit stresses and other requirements.

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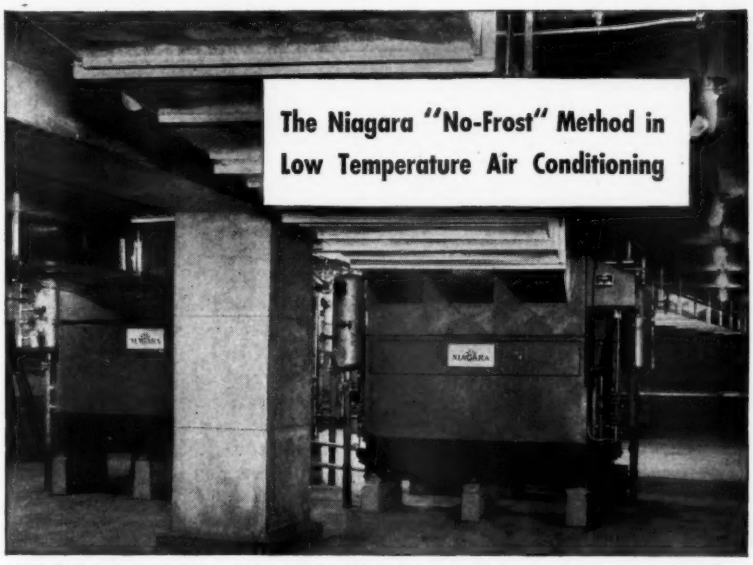

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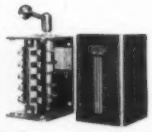
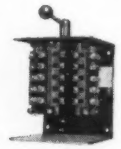
- Machine tools
- Conveyors
- Tire building machinery
- Commercial laundry equipment
- Electrically operated doors
- Other small motor driven processing equipment

Cavity mounted selector switch—Size 00

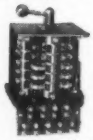


Surface mounted Size 1 reversing drum

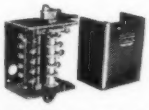


Four-speed non reversing Size 1 drum

Two handle drum for 4 speed, full reversing motor

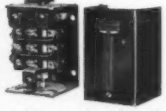


Star delta skeleton type drum for machine cavity mounting

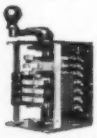


Lathe master switch, shipper rod operated

Rope operated reversing drum for use on small hoists



Self centering Size 0 reversing drum with tear drop handle



Primary resistor type reversing drum for use on small cranes

Special multi-speed drum for floor scrubber

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Bulletins . . . . . Catalogs

Electrical

101 **Selenium Rectifiers**—This 10 page catalog presents the latest information on these rectifiers made by this firm. Low voltage, remote controls, self-contained, and laboratory models are described and the principal data given. Notes are added on other types they make. Richardson-Allen Corp.

102 **Sanitary Motor**—Bulletin No. 711, 4 pages, presents a phantom view of the motor with note on each part of the motor. Flow of the cooling air through the motor is diagrammed. Typical mountings and current connections are shown. Louis Allis Co.

103 **Unit Shell Electric Motors** — Form No. 1845, 16 pages, describes and depicts the construction of these motors and all the claimed advantages. Numerous photos, exploded views, and parts photos supplement the text. Dimensional tables and drawings are provided. Motors Div., Robbins & Myers, Inc.

104 **Insulated Wires, Cables and Cords**—Catalog and Handbook No. 10-F, 98 pages, is a tab indexed handbook for selecting insulated conductors. Indexed are power and control, lighting, apparatus, switchboards, electronics, magnets. Tables of sizes, capacities, uses, wrapping, and a chart for selecting size for circuit length, load and voltage drop are given. Rockbestos Products Corp.

105 **Guide for Electric Motor Selection**—Bulletin No. 51B6052J, 12 pages, provides detailed specifications covering squirrel-cage induction motors and application data, range of sizes and speed torque curves on synchronous, wound rotor and d c motors. Allis-Chalmers Mfg. Co.

Property Maintenance

106 **Floor Surfacing Handbook**—Form No. DP-1046, 48 pages, is an indexed handbook of this firm's products to aid the engineer in selection of resurfacers for various types of floors. Index is by material and kind of traffic. Tables, photos, lists of types of applications are given to aid. Stonhard Co.

107 **Floor Safety** — This 8 page bulletin explains the hazards of slippery floors and proceeds to explain how the firm's products are claimed to eliminate the hazard. Numerous sketches highlight the text and show products. Walter G. Legge Co., Inc.

108 **Coloring Concrete Floors** — Bulletin 461002310, 4 pages, explains how the coloring materials made by this firm can be applied to concrete floors to obtain the color desired for pleasing effects. A. C. Horn Co.

109 **Rubber Mats and Matting** — Catalog Section 6100, 8 pages, gives detailed description of the construction of the various products and pictures some typical applications. Included are: platform and standard perforated mats, runner and multiple link matting, molded and perforated door mats, sponge standing mats. B. F. Goodrich Co.

110 **Acid and Alkali Resistant Resin Coating** —Bulletin No. 24, 4 pages, explains in detail the advantages of this coating for certain uses. Company also lists the applications for which it is not suitable. Application instructions are provided as is general data. Nukem Products Corp.

111 **Safety Flooring**—Bulletin S-F16, 4 pages, describes briefly but illustrates plentifully with application photos the use of the abrasive strips this firm makes to be applied to spots needing safe footing. Available in four colors. Sample supplied. Minnesota Mining & Mfg., Co.,

112 **Glass Construction Blocks** — Bulletin G5270, 36 pages, presents the story of the use of glass blocks for interior, exterior, and partition construction in industry. Several pages of drawings are given on the applications for various types of construction with instructions for installing. Pittsburgh Corning Corp.

113 **Aluminum Roof Coating** — This four page folder explains the aluminum roof coating made by this firm. The claimed advantages are given. Liberty Chemical Products Co.

114 **Insulating Roof Tile** —Bulletin KBI-485, 8 pages, describes the physical properties and construction specifications of this new tile. Design data, application sketches, and technical data on insulating value, strength, fire resistance, weight, dimensional stability, nail holding power, and light reflectivity are given. American Structural Products Co.

115 **Concrete Floor Repairs**—This 4 page leaflet explains the application and characteristics of this product for patching floors. Smooth-On Mfg. Co.

116 **Roof Repair Material** —Bulletin 25M, is a six page folder that describes and illustrates with photos and sketches the product for repairing roofs made by this company. Coverage tables for various types of roofs are given. Flexrock Co.

117 **Floor Machines**—This is a 4 page bulletin explaining the many different uses to which these heavy duty floor machines are suitable; ie., scrubbing, wax-

ing, polishing, buffing, sanding, refinishing, and dry cleaning. General Floorcraft, Inc.

118 **Odor Control**—Form 7279, 12 page pocket booklet, describes and explains the function and operation of the two products made by this firm for cleaning, disinfecting, and deodorizing. Listed are the industries for which the products are suitable. Many photos depict the product's use in various industries. Oakite Products, Inc.

119 **Quonsets** — This excellently done book, 20 pages, tells the complete story of the Quonset hut and the role it has been given in industry. The booklet points out the many features of Quonset huts such as strength, nailability, uniform quality, accurate dimensions, fire resistance, rot-proof, warp-proof, termite-proof, fast erection, and durability. Drawings and photographs show how various models of Quonsets can be used for everything from modern homes to warehouses, tool rooms, offices and even small manufacturing plants. Stran Steel Div., Great Lakes Steel Corp.

120 **Metal Roofing**—Bulletin of 24 pages tells how destructive forces can give roofing troubles an early start and increase repair bills. Full data is contained herein on a new soft-temper Monel roofing sheet. International Nickel Co., Inc.

121 **Asbestos Cement Board**—Form No. 5578, 4 pages, depicts the applications for which this asbestos cement board is suitable. Handling and installation details are given. Philip Carey Mfg., Co.

122 **Rubberlike Flooring Material**—Bulletin 9634-F, 8 pages, pocket size, describes and illustrates with installation photos the flooring material made by this firm. Bird & Son, Inc.

123 **Fan and Motor Bases**—Catalog TR-801, 4 pages, describes these vibration isolation motor and fan mounts which are adjustable. Closeup photo shows typical construction as do line drawings. Korfund Co., Inc.

124 **Washroom Advisory Service** is a 40 page book in color summarizing experience and knowledge gained from the study of 300,000 installations throughout the country. The booklet emphasizes the importance of convenience, safety, economy and efficiency. The washrooms, smoking areas in industrial plants, lounge and locker facilities. Layouts and descriptions of 35 typical installations are shown. The Scott Paper Co.

Dust Control, Heating, Ventilating

125 **Space Heaters**—Bulletin No. 300, 8 pages, depicts with construction and application photos and drawings the tall unit heater for spot locating in plant. Small floor space necessary is highlighted feature. Thermobloc Div., Prat-Daniel Corp.

126 **Boiler Feed Water Level Control**—Bulletin No. 483, 4 pages, describes the installation and operation of the controls made by this company in a gas plant. Photos and drawings show how and where the controls are installed. Northern Equipment Co.

127 **Air and Gas Pipe Line Filters**—Bulletin No. B-1A, 8 pages, explains and depicits the construction and application of these filters to various services. Photos of applications in use are given as are phantom views to show how the filters operate. Dollinger Corp.

128 **Vertical Flow Unit Heaters**—Catalog No. 2648, 16 pages, presents the line of vertical flow unit heaters in various sizes for either steam or hot water. Full selection information given. Young Radiator Co.

129 **Dust Collector Handbook** — Catalog 72-A explains the Where, Why and How of dust control. A manual of engineering information, completely indexed and illustrated accompanies the sections describing the company's line of dust control equipment. Drawings and photographs are used liberally. American Wheelabrator & Equipment Corp.

130 **Industrial Dust Control**—This bulletin of 54 pages is not intended as an engineering manual on the subject. It does use sketches, photos, cutaway drawings, and phantom views to show equipment and its application. It discusses the recommended equipment for various jobs. Pangborn Corp.

131 **Steam Heating System Treatment**—This bulletin of 4 pages describes treatment and equipment for cleaning steam heating and processing lines. Photos and drawings are given to show how it works and its application. Pressure-Jet Systems.

132 **Industrial Boiler Controls**—Bulletin C-35, 4 pages, is a condensed catalog and price list of this maker of controls for small boilers of low or high pressure. Listed are several different water level controls, low water alarms and fuel cut-offs, safety valves, and conversion heads. McDonnell & Miller, Inc.

133 **Draining and Venting Drying Rolls**—Technical Bulletin No. 2, 8 pages, describes this company's system for draining and venting rotating cylinders. Subjects discussed include: causes of inefficiency, wastage of steam, output and cost, waterlogging, steam locking, steam operated suction dryers. Sarco Co., Inc.

134 **Processing Duplex Strainer**—Catalog No. 37, 4 pages, describes briefly but illustrates with many photos, cutaway drawings, dimensional drawings, tables, and charts the duplex strainers made by this company. R-S Products Corp.

135 **Air and Water Driven Tube Cleaners**—Bulletin Y26, 4 pages, presents with exploded views the construction and operation of these cleaners for boiler tubes and general service. Tables give sizes available for

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From the cover is suspended the bucket and lever with valve through a fulcrum plate which serves also as the valve seat retainer. An outstanding feature of this Keckley Type B Trap is the positive alignment of the valve with respect to the valve seat, so important in the continued performance of any Trap. This is accomplished through the dual purpose "fulcrum and valve retaining plate," eliminating any possibility of misalignment such as occurs when the fulcrum point is dependent upon lugs in the cover or similar arrangement, where a slight inaccuracy in machining can cause considerable variation in relation of valve and seat. Tight seating in such cases is difficult whereas in the Keckley Type B Trap it is positively assured at all times.

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tubes sizes, both straight and curved. Lagonda Div., Elliott Co.

136 **Spray Pond Equipment**—Bulletin 13-1, 4 pages, presents the equipment made by this firm for use in cooling spray ponds. Layout plan of equipment in a pond and steam tables for steam condenser work are given. Binks Mfg., Co.

137 **Soot Remover**—This 2 page catalog sheet explains the product of this firm for removing soot. Product is a chemical which when introduced into the fire box gives off a white gas that is said to do the work of loosening the soot. RX Chemical Co.

138 **CO_2 Indicator**—Bulletin No. 206, 4 pages, pictures and describes the indicator for checking combustion made by this firm. Prices of instrument and replacement parts are given. Last page contains operating instructions. Burrell Technical Supply Co.

139 **Combustion Test Set**—Bulletin No. 220, 4 pages, depicts in detail the components of the combustion test sets and tell how they are used. Some other instruments made by the firm are described. F. W. Dwyer Mfg., Co.

140 **Combination Gas and Oil Burners**—Bulletin No. 205, 4 pages, describes and illustrates the combination oil and gas burners made by this firm. Equipment and application photos and a cross-section blueprint drawing of the burners with Types A and AB wide range mechanical atomizers serve as illustrations. Peabody Engineering Corp.

141 **Combustion Controls**—Form 5067 is a 2 page catalog section showing the several combustion controls made by this firm. The purpose of each control is described and explained. Perfex Corp.

142 **Multiport Drainers**—This 8 page bulletin illustrated with cutaway sections, application photos, and tables, explains the capacities, dimensions, construction data, and list prices of the multiport drainers. Five in both standard and external cage drainers are available. Connections range from 1¼ in. to 6 in. Cochrane Corporation.

Instruments and Controls

143 **Electrical Cabinet Door Switches**—Data Sheet No. 45, describes and explains the principles of operation. Switch is set so that when the door of the cabinet is opened the current is automatically shut off. Micro Switch Corp.

144 **Liquid Level Indicators**—Bulletin WG—1822, contains the latest information on the new addition to this line of liquid level indicators, and the control unit for remote signalling and controlling devices. Phantom and cross-sectional views show the construction and operation. Many photos depict the units and their application. Yarnall-Waring Co.

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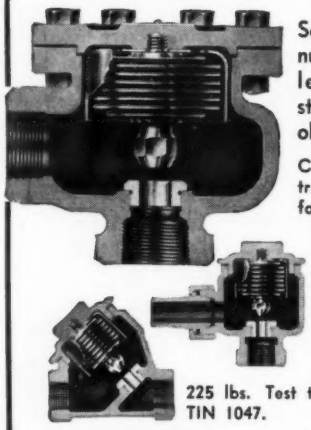

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146 **Indicating and Recording Instruments**—Form No. 1301, 12 pages, presents several different instruments made by this firm. Included are: High and slow speed chart meters, speed recorders, speed indicators, resistance recorders, boiler water concentration recorders, time recorders, relays with indicators. Esterline-Angus Co.

147 **Water Flow Measuring Equipment**—Bulletin 310, 20 pages, describes and illustrates with photos, cutaway sections, flow diagrams, and possible application sketches the equipment made by this firm. Given are: typical meter locations, pressure loss curves, specifications. Prices are listed. R. W. Sparling.

148 **Electrical Instruments**—Bulletin GEC-227, 24 pages, presents the wide variety of instruments for indicating, recording, timing, that are made by this firm. Explanations, specifications, and photos are provided for instruments described. Apparatus Dep't, General Electric Co.

149 **Etched Scale Thermometers**—Bulletin 208, 4 pages, presents the thermometers made by this firm. Tables are given for each type with graduations and length, as well as prices. Wm. Hiergesell & Sons

150 **Mechanical Flow Meters**—Bulletin 2M-48, 12 pages, describes and illustrates the flow meters made by this firm. Photos, diagrams, and data on dimensions and capacities are given. A flow diagram helps the explanation. Component parts photos show important parts. Hagan Corp.

151 **Flow and Indicating Meters for Fluids**—Bulletin No. 301-B, 40 pages, is divided into 10 sections on: flow mechanisms, primary elements, integrators, auxiliary recorders, accessories, and installation features. All are illustrated with photos, diagrams, and drawings, to explain the construction and operation. Bailey Meter Co.

152 **Electronic Servo Systems**—This bulletin contains ten sheets of information. Each sheet describes and pictures with diagrams a servo system as made by this firm. General notes as to type, style, power required or exerted, suitable applications, and other information is provided. Askania Regulator Co.

153 **Technical Bulletins on Scales**—Six new technical bulletins on various types of scales made by this firm are presented in this catalog with stiff paper cover. Total of 68 pages of information. Philadelphia Division, Yale and Towne Mfg., Co.

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 18 and 19 and 50 and 51.

Tools

154 **Soft Tube Working Tools**—Form 347, 16 pages, pocketsize, contains brief descriptions and illustrations of the different tools made by this firm for working brass and copper tubing. Sizes and prices are given for tool and accessories. Imperial Brass Mfg., Co.

155 **Air Driven Tools**—Booklet No. 30-A, 48 pages, explains the tools made by this firm and discusses the use of most to gain the best results. Dimensional drawings, specification tables, accessories, and sizes of all the various tools are given. Rotor Tool Co.

156 **Boiler Tube Expanders**—Bulletin E-2, 6 pages, presents the various designs of tube expanders, sizes, tube size they fit, shipping weight, and prices. Richard Dudgeon, Inc.

157 **Using Sandpaper**—Form 931, 32 pages, explains with text and photos how sandpaper is made. Instructions are given covering some of the uses of sandpaper and results that may be expected. The various forms in which it is available are shown. Behr-Manning Div., Norton Co.

158 **Grinders and Buffers**—Bulletin No. 129 G, 4 pages, depicts and describes the pedestal and bench mounting grinders and buffers. Also described is the filtering unit for returning used air to the room. Specifications are given as well as prices on the various models and sizes. Cincinnati Electrical Tool Co., Div., R. K. LeBlond Machine Tool Co.

159 **Puller for Large Pulleys**—Form No. 100, 4 pages, describes and illustrates with photos and sketches the adaptability of these pullers to many jobs. Shows how one man can operate the unit. Table of capacities is given. Industrial Engineering Equipment Co.

160 **Chatterless Countersinks and Reamers**—Bulletin 16-C, 4 pages illustrates and explains the countersinks, reamers, drill reamers, taper reamers, ball nose drills, and mills and cutters. Information for best operation, sizes, and prices are given. Severance Tool Industries, Inc.

161 **Diamond Cutting Tools**—This 4 page bulletin explains and pictures the diamond mounted tools for fast cutting. The bonding and action of the tools are explained. Triangle Equipment Co., Inc.

162 **Carbide Tipped Tools**—Form 50-A is a pocket sized booklet giving the various sizes of carbide tipped tools with list prices. 2 pages are given to conversion table of cutting speed. Tools discussed are presented in photos. Chicago-Latrobe Twist Drill Works.

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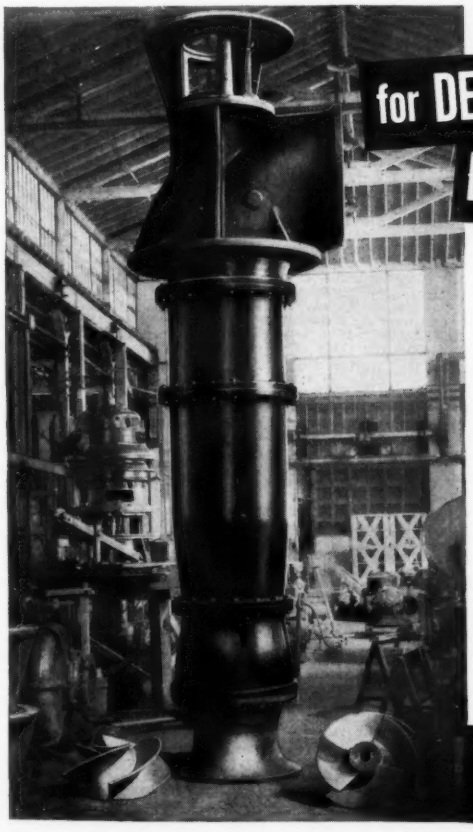

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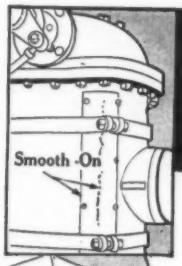

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166 **High Pressure Hydraulic Pumps**—Data Sheet 67, 12 pages, includes photos, pump dimension drawings and pump selection charts for selecting the type and size pump required for various operations. Aldrich Pump Co.

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168 **Aluminum Bronze Centrifugal Pumps**—Bulletin 85, 4 pages, contains illustrations, diagrams, and charts showing representative characteristics of two pump sizes. Information is given concerning design features, construction and drives. Ampco Metal, Inc.

169 **Automatic Proportioning Control**—Bulletin PKA-47, 4 pages, contains application information on the proportioning control pumps. Hook-up diagrams make up the illustrations. The method used for control is explained and claimed advantages stated. Hills-McCanna Co.

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171 **Fluid Drive Variable Delivery Feed Pump**—Bulletin 4420, 4 pages describes and illustrates with photos, installation hook-up sketches, dimensional drawings, and specification table the pump made by this firm. Oilgear Co.

172 **Centrifugal Pumps**—Bulletin W-305-B1, 12 pages, presents information for selecting a pump. Types CN and CNE in 3 sizes are explained with specifications, rating charts, installation data, dimensions, and photos of the complete units. Worthington Pump and Machinery Corp.

173 **Single Stage Centrifugal Pumps**—Bulletin No. 83-29, 28 pages, describes and illustrates outstanding features of design and construction with a listing of pump ratings and essential dimensions. Catalog can be of aid in selecting required pump. De Laval Steam Turbine Co.

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Materials Handling

175 **Belt Conveyors**—Catalog 785, 160 pages, is virtually a handbook on the subject of belt conveyors. The standard conveyors made by this firm are described and illustrated with application photos as well as tables and charts. These standard units have been indexed. A line of anti-friction idlers is treated, as are other necessary items of equipment for use with conveyors. Much engineering data for figuring installations is given. Jeffrey Mfg., Co.

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177 **Conveyors and Related Equipment**—Bulletin No. 125-A, 4 pages. Two pages illustrate twelve different units. Last page briefly describes entire line of materials handling equipment. Robins Conveyors Div., Hewitt-Robins, Inc.

178 **Telescopic Walking Lift Truck**—Bulletin P1076, 4 pages, give all the engineering information on these lightweight high lift fork trucks. Dimensional drawings and tables are provided as well as turning radius drawing. Philadelphia Div., Yale & Towne Mfg., Co.

179 **Industrial Truck Crane**—Bulletin No. 78, 6 pages, presents all the information concerning this crane for use around industrial plants. Dimensional drawings, angle of boom lift, boom swing radius, are given. Silent Hoist & Crane Co.

180 **Industrial Truck Batteries**—Bulletin GB-754, 6 pages, presents the pertinent data that is the latest information on this type of battery made by this firm. Listed are the complete specifications for each size and capacity, including the dimensions. Gould Storage Battery Corp.

181 **Electrical Lift Trucks**—Bulletin TC-17, 24 pages, depicts the varied uses to which battery powered trucks may be put and proceeds to show case histories from plants. Industrial Truck Div., Clark Equipment Co.

182 **Hydraulic Materials Handling Systems**—Catalog No. 448, 16 pages, describes and illustrates with photos of parts and assemblies, sketches of possible hook-ups, and controls, the several kinds of machinery for handling dusts, fly-ash, and other flake and granular materials. Allen-Sherman-Hoff Co

183 **Material Handling Equipment**—Bulletin No. 60, 6 pages, presents briefly the different materials handling devices made by this firm. These include hand lift trucks, flat bed 4 wheel trucks, portable conveyors, platform and stacking elevators, and wheel tractor cranes as well as end dump carts. Mercer Engineering Works, Inc.

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Mechanical Power Transmission

184 **Flexible Couplings**—Catalog C 41-48. 32 pages, describes and explains the construction and operation of these flexible couplings by means of exploded views, drawings that depict effect of strains and stresses imposed by mis-alignment. Dimensional and cross-sectional drawings, and tables of specifications. Torsional deflection charts are also provided. Morse Chain Co.

185 **Small, Fluid, Variable Speed Transmissions**—Bulletin 67110, 8 pages, illustrates and describes this line of transmissions up to 3 hp. Also given is information on four styles of manual, hydraulic, and hydro-electric control devices. Photos and dimensional drawings with tables are given for each type. Oilgear Co.

186 **Adjustable Diameter Wedgbelt Drives**—Bulletin WRB-48. 4 pages, presents the story of the variable diameter pulleys and how to select the right drive for a particular job. Tables for use in selection are provided. Tables and dimensional drawings also included to provide data. American Pulley Co.

187 **Flexible Couplings**—Index 2197, 4 pages, contains data on all the flexible couplings for direct connected drives handled by this firm. All couplings are pictured and pertinent information about them included. A table shows how to select the right size coupling. B. F. Goodrich Co.

Miscellaneous

188 **Departmental Air Compressors**—Bulletin E-215-B, 4 pages, is an explanation presented in the form of an article on the subject of the use of departmental air compressors. Last page describes the several types and models of compressors this firm makes. Table gives specifications of compressors. Davey Compressor Co.

189 **Industrial Ovens**—This 24 page bulletin describes and illustrates with application photos the ovens for many different industrial uses made by this firm. A line drawing is given to show how a huge oven and all the necessary accessories are fitted into a building. Small ovens as well as all types of accessories are described. Kirk & Blum Mfg., Co.

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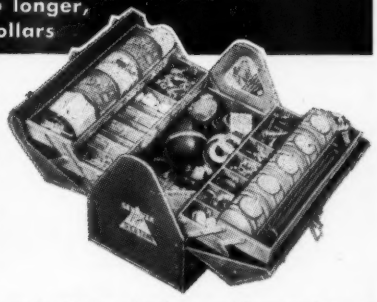

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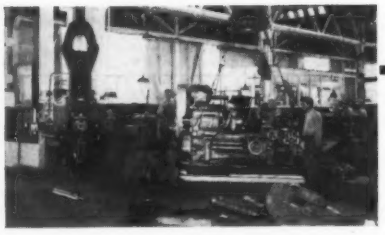

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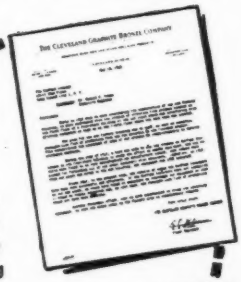

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During the year of 1940, a test was made by placing presses on Korfund Isolators in the four-story building to study the effect on nearby equipment, and the results were found to be very satisfactory—so satisfactory indeed, that orders were placed for furnishing all of our press equipment with isolators. Therefore, in 1942, when our plant was moved to the new building, our equipment was 100% isolated.

Since 1942, to the present time, the results of using the Korfund Isolators have been very successful and effective. If the Korfund Isolators were not installed in our new plant, we would have found it necessary to rearrange our equipment so that it would be widely separated and, in that case, the straight-line flow of production would not have been possible.

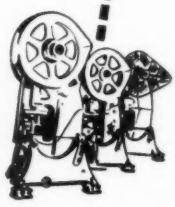
Another favorable effect that we have experienced in using the isolating equipment, is that the noise level in the factory area is considerably reduced

Very truly yours,

THE CLEVELAND GRAPHITE BRONZE COMPANY

(Signed) L. E. Wilson, Plant Engineer

May 18, 1948



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